Organic Gardening

JUNE 1948
25 Cents

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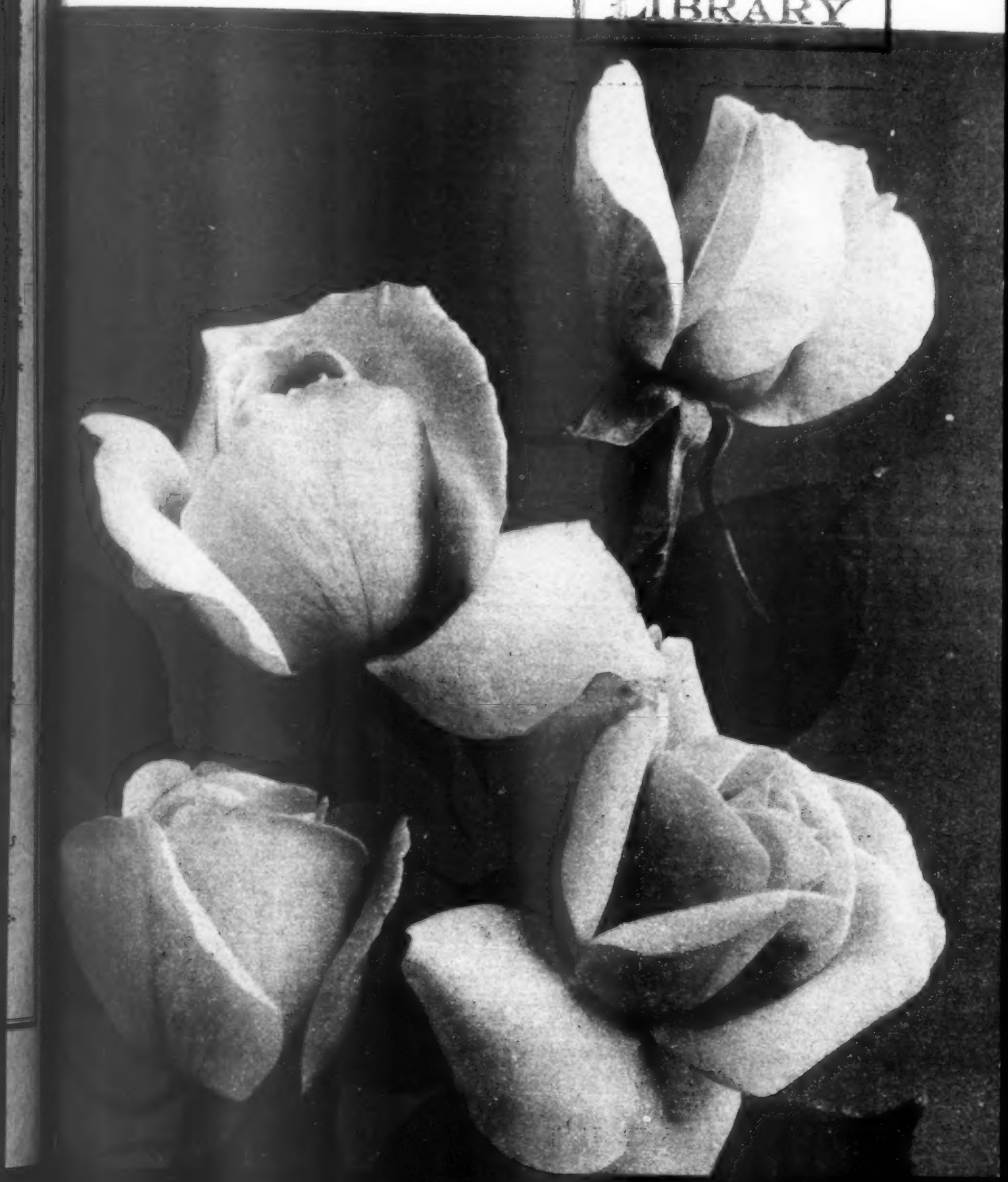

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It is good for every kind of fertilizing; and it has about four times the fertilizer value of barnyard manure.

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We also supply earthworms:—The small Western kind that are good in your lawn—because their castings are small—and easy to work among in your gardens and field. To get a large earthworm population in your soil quickly, plant more earthworms among those you already have; otherwise it may take you years. EARTHWORMS REALLY DO IMPROVE THE SOIL! Earthworms and 6 ACE SUPER-COMPOST make an excellent combination for your soil.

We cordially invite you to write for literature and prices.

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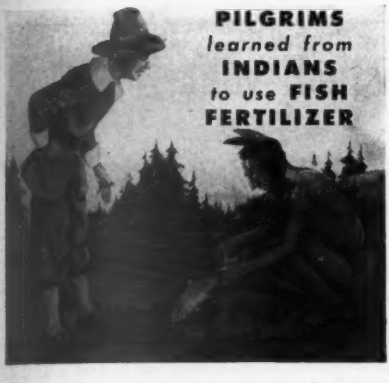
West Avenue 150, Box 48, San Lorenzo, California



"Sea-Going FISH the IDEAL FERTILIZER"

—says Editor J. I. Rodale

"A sea-going fish, unlike cattle, does not eat food raised with chemical fertilizers. It feeds in waters rich with minerals, prominent among which is the most valuable element, iodine." Science says Mr. Rodale is right. Analysis shows that these many essential minerals are not only present in "sea-going fish" — they are also "available" for plant use.

Unless you got your garden plot directly from the Indians, SOMEBODY depleted its vital essentials before YOU took over. This deficiency is perpetuated in the compost you produce, and in the manure you get from farms which probably suffer from soil deficiency.

The SWIFT, SURE method to replace soil deficiencies is to add something you KNOW contains those missing soil elements

ATLAS *FERTILIZER EMULSION*

COMPLETE contents of ATLAS FERTILIZER EMULSION

1. Nitrogen
2. Phosphorus
3. Potassium
4. Calcium
5. Magnesium
6. Iodine
7. Chlorine
8. Boron
9. Copper
10. Iron
11. Manganese
12. Zinc
13. Sodium
14. Silicon
15. Aluminum
16. Strontium
17. Titanium

is a POWERFUL CONCENTRATE, made from the non-edible (richest in fertility) parts of sea-going fish. It is rich in natural "life factors" without which no plant or animal long survives — including the complete B-complex vitamin groups. It contains more plant food essentials and valuable trace minerals than any soil, compost, manure or other fertilizer.

ALL the elements in ATLAS FERTILIZER EMULSION are quickly available for plant growth — a fact of vital importance as no element can be used by any plant unless it is water-soluble. Thus ATLAS FERTILIZER EMULSION can enter the plant root-hairs directly.

ATLAS FERTILIZER EMULSION in your soil or compost, "starts a chain reaction" which multiplies its benefits. It strongly stimulates earthworm activity and reproduction — and multiplies the nitrogen-fixing soil bacteria which manufacture fertilizer for you.

ATLAS FERTILIZER EMULSION is 100% ORGANIC, plus a required minimum of preservative, which is more than neutralized by either the alkali in your "city water", or by a very small part of the lime you use in compost. Highly concentrated, it should be diluted one pint to 80 gallons of water for gardening — one pint to 20 gallons for compost. Apply with watering can or hose applicator.

You will be delighted with the QUICK results — will KNOW you are replacing soil deficiencies.

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By mail only for introduction.

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Please send me additional information . . . . . ☐

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Organic Gardening

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• Editor and Publisher
J. I. RODALE

Managing Editor
DR. WILLIAM H. EYSTER

Art Director
KARL MANAHAN

Staff Photographer
ROBERT RODALE

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The Healthy Hunzas

by

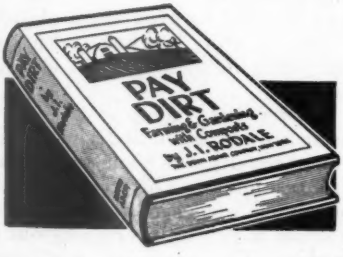
J. I. RODALE

author of Pay Dirt

•

WHO are the Hunzas? Why are they so healthy and so happy? Explorers have long known that the Hunzas, tucked away in a fold of the mountains of Northern India, are an unusual race and the healthiest on earth.

Travellers have long been returning with fascinating accounts of the habits and customs of these buoyant, well-adjusted people. James Hilton knew of them, and based his best-selling LOST HORIZON on stories he had been told about the HUNZAS. The *Healthy Hunzas* really do live in Shangri-La, where there is little or no disease, delinquency or crime, where everyone is healthy and happy and lives to a ripe old age. Mr. Rodale believes that the reason for all this too-good-to-be-true way of life rests with the good earth of Hunza-Land itself. For the Hunzas till their mountainsides in accordance with Nature's Law of Return. Readers of ORGANIC GARDENING know, of course, its credo: healthy plants, healthy soil, healthy people. The HEALTHY HUNZAS is a travelbook like no other: a fascinating account of a fabulous people—and a lesson in soil conservation. Occasionally hilarious, often startling, its deadly seriousness and underlying purpose carry a stunning impact. Cloth, illustrated. $2.75.



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by **J. I. RODALE**

Editor of Organic Gardening

•

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Condition your soil for this year's lawn and garden

Insure garden success! Start right! Condition the soil! Healthy, vigorous-growing plants begin with good, fertile soil.

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ORGANIC SOIL BUILDER AND CONDITIONER

FOR LAWNS AND GARDENS

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An essential material for the Organic Gardener . . . . A slow-acting, long-lasting energizer that increases and replenishes the organic content of the soil . . . . Improves soil texture . . . . absorbs and retains plant-nourishing moisture . . . . helps decomposition of soil break-up into humus . . . . binds sandy soils . . . . loosens clay soils.

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If your dealer cannot supply you we will ship direct to you. Freight prepaid East of Mississippi River (Write for freight rates west of Mississippi River.) Send $2.25 for each 50 lb. bag; enough for 200 sq. ft. of NEW lawn or garden. Minimum Shipment 100 lbs. (2 bags).

HERSHEY ESTATES
HERSHEY, PENNSYLVANIA

EARTHWORMS, COMPOST, AND THE GARDEN

March 12, 1948.

Gentlemen:

About four years ago I bought seven acres of brushland and had each acre tested to be sure there were no bad spots. I now have 750 high bush blueberries which produced berries as large as ¾ inch in diameter last year. Last spring I had 30,000 strawberries. Some of my Streamliners were so large that 44 berries filled a quart basket. Fifty Boysenberries filled a quart basket. I have about 10,000 Indian Summer Raspberries and last fall I set out 2000 more plants. We had loads of berries as big as your thumb. I planted 20 pounds of seed potatoes and harvested 7½ bushels—no bugs and I never sprayed them. Gardens a few feet away had bugs aplenty and the yields in those gardens also were poor.

I have used compost a year old, using garden litter and cow manure, about equal parts, some seaweed and fish trimmings. This compost is impregnated with earthworms. We use a straw mulch on everything but the garden. The team of earthworms, compost, and water can't be beat.

H. C. Lambert,
81 Daviston Street,
Springfield, Mass.

—o—

STRAWBERRIES AT THEIR BEST

April 1, 1948.

Dear Sir:

I made my heap according to your directions and a year ago this spring I covered my strawberry bed with a thin layer of well cured compost before

the plants had raised from the ground. Previously we had but few strawberries and no runners to speak of and the plants blossomed too early for our late frosts. Well, that compost held them down for a while and neighbors thought I had killed the plants with this new compost idea. Soon they began to show great, wide leaves and magnificent bunches of buds. We had a bed in a few weeks that looked like snow and they really did set instead of blasting. We picked 45 quarts of berries off the small patch, 30 by 50 feet, and they had flavor unsurpassed by any strawberries we have ever eaten.

My garden plot is a sandy soil and the previous owner had been too generous with chemical fertilizer. Every time we had a rain it would flow the sandy soil to the lower part of the sloping plot and there wasn't an earthworm to be found. Now when I turn over the mulch of straw around my tomato plants the earthworms disappear into the ground like magic and after a rain the soil is covered with them. I now have results I can't begin to put into words where before I couldn't grow a decent sized healthy looking weed. Everyone remarks at the sweet flavor of our tomatoes and the giant size of our black and red raspberries and strawberries.

Neal C. Ladd,
R. F. D. 1,
Jericho, Vermont.

—o—

STORING CANNA ROOTS

April 4, 1948.

Gentlemen:

I wish to cite an instance which I experienced today at my summer home 839 Garfield Avenue, Ardsley, Pa., where I have for the past two years been receiving your valued publication Organic Gardening. Last fall when I dug up our canna bulbs I wrapped up twelve of them in several thicknesses of a newspaper, and the other twelve were wrapped first in paraffin wax paper with another thick wrapping of newspaper outside, tying

ROTOTILLER*

PAYS FOR ITSELF DOING DOZENS OF HARD JOBS!

ROTOTILLER offers a new and revolutionary method of weed control and cultivation. Adjust the depth of its whirling tines to a fraction of an inch; tear out weeds by the roots, cut them up, and leave them on top of the soil for the sun to kill. The loose earth left from this operation provides a fine surface, moisture-retaining mulch. One cultivation by this method equals two or three using the ancient scratch-type cultivation.

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"Young Minds With Old Bodies"

by

Melvin E. Page, D.D.S.

•

This book is a continuation of the basic principles involved in organic gardening but applied to the chemistry of the body. It is a fundamentally sound approach to the cause and prevention of degenerative disease.

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ST. PETERSBURG 4, FLORIDA

each bundle up with string and placing them in a heavy paper bag, which hung up in the cellar all winter. Today I wished to plant them, so took down the bag, unwrapping the two packages. The bulbs contained in the package wrapped only in the newspaper were all dried up, dead and useless, while the entire twelve wrapped first in the wax paper and newspaper on the outside were all in a perfectly fresh condition, appearing practically the same as when I wrapped them up in the fall. Hereafter when, in the fall, I wish to keep bulbs throughout the winter in the cellar, I shall see that they are well wrapped in paraffin wax paper. To anyone who wishes to follow this procedure I would like to suggest that they do not wrap the bulbs too tightly, thus avoiding making holes in the wax paper, which would allow the moisture of the bulbs to escape and cause them to dry out.

F. Mortimer Cleveland, M.D.,
5051 Walnut Street,
Philadelphia, Pa.

—o—

IN ACCORD WITH O. G.

March 31, 1948.

Gentlemen:

Several days ago I received your booklet, "Chemical Fertilizers Are *Not* Needed In The Garden."

Must admit that I was a little surprised to receive and read this. I say "a little surprised" because everything that I have read in this booklet is exactly what I have always figured about chemical fertilizers. I tried to raise tomatoes in my backyard garden for the last eight or ten years, but only last year did I learn how to do so. For years I have been going into the garden with my spading fork, breaking up large plots for the plants to be set out in. Because this was such back-breaking work, this year I made a hole cutter, and cut the holes the proper depth—about one quarter of an inch in diameter. The plot in which the tomato plants were set was covered with old dead leaves that had de-

cayed. Believe me, we had the finest crop of tomatoes in this part of the city. We picked off the last green tomatoes the 25th of December and allowed them to ripen in the house as a freeze was predicted for that night.

You have something there in your "Organic Gardening", and I know it for a fact, because as I have stated above, I found that out for myself the hard way.

I used no sprays or chemical fertilizers of any kind on these tomatoes, just the old rotted leaves that have been decaying in the ground for quite a long time. The flavor of this year's fruit was much better than any previous crop, and this year I hope to double what I did last year.

As I want to learn more about this type of gardening, I will send in my subscription within the next few days.

I have always thought that it was not a good idea to spray all vegetables with poison sprays, and have always been against it. I see now that I was right all the time. When I was a youngster at home we had gardens, but not insect troubles like we do today. There is bound to be a reason for all this and I have been trying to get to the bottom of it for a long time.

Dick O'Nare,
928 Pasadena St.,
San Antonio 1, Texas.

—o—

COMPOSTED SALVIA

March 4, 1948.

Gentlemen:

I am so thrilled by my garden results which I get by using your method

WHEN you *condition* your soil first — you will be amazed at how much better your seeds and fertilizer will do for you.

Premier Peat Moss literally gives your soil *new life* — and gives your garden added beauty and vitality. It absorbs 20 times its weight in moisture . . loosens and aerates heavy soil . . . . . binds and gives body to light soil . . . . . prevents leaching. It makes water and fertilizer penetrate deeply—feeds the roots *as they need it.*

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"Versatile light tools that make weeding a pleasure"

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CAN YOU WEED YOUR GARDEN WITHOUT KILLING ANGLEWORMS WITH VICIOUS CUTTING BLADES?

CAN YOU WEED WITHOUT CUTTING LATERAL ROOTS OF YOUR PLANTS?

CAN YOU WEED QUICKLY AND EASILY WITHOUT SOILING YOUR HANDS OR CLOTHING?

CAN YOU SEE WEED SEED BLOWN IN LIKE A SKIFT OF SNOW AND NOT WORRY ABOUT IT?

CAN YOU WEED A GARDEN WITHOUT STOOPING? FROM START TO FINISH?

CAN YOU WEED YOUR LAWN PLEASANTLY, WITHOUT YEARNING TO USE POISON?

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Recommended by ORGANIC GARDENING MAGAZINE

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SOILSERVICE—Townsend, Mass.
BRYAN & SHEFFER—Portland, Ind.
AUSTIN FEED & SEED CO.
Chattanooga, Tenn.

of composting. I always used leaves, etc. but never got the results I now get. Last spring I bought a dozen plants of red salvia from my florist and intended to plant them in the proper place in the garden. Temporarily I stuck all twelve plants in the corner of my finished compost heap. Illness prevented me from transplanting them, so that all twelve of them remained together in the compost heap. Then hot weather set in and I could not move them. By fall I had a tremendous burst of salvia in the compost, the most wonderful sight and a surprise to everyone who beheld it. I think I will grow them again this way on purpose. That compost is dynamite!

Mrs. Albert Johnson,
3106 Netherland Ave.,
New York 63, New York.

—o—

ORGANIC GARDENING IN ARKANSAS

February 29, 1948.

Gentlemen:

I thought perhaps you might like a few lines from this section of the country, pertaining to organic gardening.

This, the northwest corner of Arkansas is particularly adapted to gardening and fruit of nearly all kinds, as well as dairying. The time was, several years ago, when this section of the country was noted for its fine apples, pears, apricots and grapes. There were thousands of acres of apple orchards and without fertilizers and sprays, they were raising the finest of fruit. Everything was taken from the ground and nothing put back, with the result the fruit became dwarfed and inferior. Agricultural college "experts" were called in to remedy the situation and growers were told to use chemical fertilizers. They did and then the insects came and growers were told to spray their trees. But conditions grew worse instead of better, until today there are but a very few small orchards left in the country and the fruit is very inferior.

I have a small place of only two

acres, one acre of which is used exclusively for gardening and it has been a terrific fight with insects for the past five years, the length of time I have been here. I have five fine peach trees and in spite of all the sprays and fertilizers I have given them, they did not bear any fruit. Last year I decided to try compost. I knew nothing about it, or how to go about making it, but made a pile in a crude way, using leaves, grass, lime, and chicken manure. This I heaped around my trees and was rewarded for my effort by obtaining a bushel of peaches for the first harvest.

About that time I received your literature pertaining to *Organic Gardening Magazine*—it opened my eyes —and I lost no time in sending in my subscription for I knew that I was getting on the right track. As soon as I received "Compost and How to Make it," I really went to work and now I have between seven and eight tons of fine compost ready for spring garden use. No more chemical fertilizers and poison sprays for me.

E. A. Mellen,
307 S.E. "A" Street,
Bentonville, Arkansas.

—o—

A HEALTHY GARDEN, then SUPERPHOSPHATE, DISEASES, AND PESTS, AND FINALLY THE POISON SPRAYS

April 8, 1948.

Dear Sirs:

I have before me a booklet sent to me telling me all the benefits of organic gardening so I thought perhaps you could tell me just what is wrong with my gardening.

We have a chicken farm on which we carry around 1500 chickens the year round and until a year or so ago we had one cow. We have four acres of ground most of which is pasture. Our vegetable garden is approximately 60 x 100 feet. Now we have heaps of rotted manure to use on the garden, and the dozen fruit trees and flower borders around the house. And until

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THE AMAZING SOIL CONDITIONER

This is the product the organic gardener has been looking for. Compost-plus, already prepared for the city gardener. Tremendously condensed humus preparation augmented with cultures containing billions of selected microorganisms. It is soft, black, and velvety with sweet woodsy odor. It will not burn. For use on house plants, in the garden or in the greenhouse.

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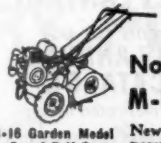

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Please rush complete information on M-E Rotary Tillers
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last year nothing else was ever used on anything. The first two years everything grew wonderfully. But last year I got some superphosphate because I was afraid the manure was not rich enough in phosphates. Then came the bean beetle, the cucumber beetle, the cabbage worms, the spinach leaf miner, maggots in the radishes, wilt on the muskmelons, and late blight on the cucumbers, club root on cabbage, mites on the delphiniums, nematodes on the chrysanthemums, red spider on the phlox, mildew on the hollyhocks, black spot and canker on the roses, brown rot on the peaches and cherries, cuculio on the plums, etc. etc.

In order to have something for myself I had to spray and dust. I use rotenone and sulphur as a dust and nicotine sulphate (I forgot to mention aphids of all kinds) and a 3 in one rose spray with some DDT.

Now, mind you, this was all on ground which had been heavily manured, well prepared, and considered very good soil. Also my garden was the best in the whole section, bigger and better vegetables and flowers with not a drop of chemicals until I had to use them or be overtaken by the crawling, boring and flying bugs and worms.

Please can you tell me where I have failed as you say insects do not like the taste of healthy plant tissue. Why do the cabbage worms destroy the most beautiful cauliflower and the cutworms always cut off the biggest tomatoes?

Mrs. Charles Hula,
R. D. 2, Codfish Hill,
Bethel, Conn.

(EDITOR'S NOTE: Apparently the highly soluble superphosphate so upset the nutrition of your plants that they became susceptible to diseases and insect pests.)

—o—

COMPOSTED TULIPS

Dear Sir: March 7, 1948.

In following through on articles in your magazine, I have been the envy

of my neighbors as far as large beautiful tulips go. These past two years I have raised blossoms that surpassed the display garden at the New York Botanical Gardens.

Edward F. Demarest,
6 Silver Lake Ave.,
Route 19,
New Brunswick, N. J.

—o—

POTATOES FREE FROM BLIGHT AND PESTS

February 20, 1948.

Dear Sir:

In 1939 I bought a run-down farm of 60 acres in Jefferson County, Pa. That year I planted potatoes and field corn. They did not do well as the soil was too wet early and too dry and hard later. The first few years I used a 16-16 fertilizer. About 1944 I saw in Peter Henderson's catalog a statement to the effect that "plowing under a good crop of crimson clover is the

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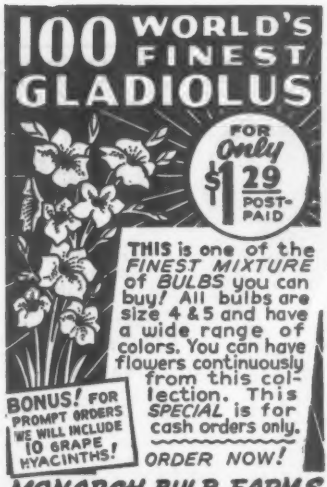
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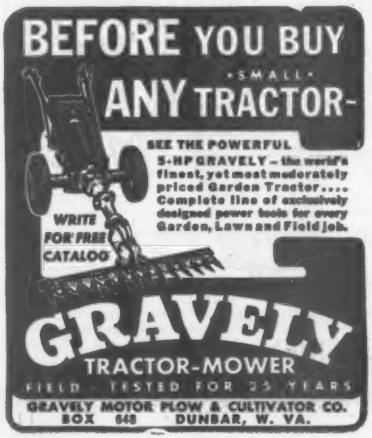
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equivalent of 20 tons of stable manure per acre." I sowed 15 pounds of seed per acre the latter part of July. There were four feet of snow that winter and the clover came through in good shape. I let it go to seed before plowing under. There was not much snow the following winter and it did not do so well.

Each year since I have sowed crimson clover and rye grass and plowed them under. In 1944 I planted two bushels of Irish Cobbler potatoes after having dipped the seed in Semasan Bel (a mercury salt). One week later I planted three bushels of Green Mountains, not dipped. About one-third of the Irish Cobblers were washed out by heavy rains three times, and the Green Mountains washed out twice. Each time the Irish Cobbler seed was covered with large ants eating them, but no ants occurred on the Green Mountains. The Green Mountains did much better than the Irish Cobblers and had no scab either. I have used no dip since.

In 1947 I had 11 rows of potatoes planted 42" between the rows and 200 feet long. Seven rows of my own seed and four rows of seed from Maine. My own seed did much better than the new seed. I am told that in Maine the potato plants are pulled up before the tubers are mature to prevent blight. It seems to me that a mature potato makes better seed than a green one, and this proved to be the case last year for me.

I used no commercial fertilizer last year and no 20-80 dust that I had used each year before for blight and bugs. On 25 feet of each of the 11 rows I put compost, then it got dark and I never found time to put compost on the other 175 feet of the rows. The potatoes were better under the compost. I cultivated each week until the vines were too large to get through, and sowed rye grass at the last cultivation. The tops grew into one solid bed. *There were neither potato beetles nor blight.*

About 1890 I worked for a market gardener during vacations. He grew potatoes and had plenty of potato bugs. He used commercial fertilizers. I have seen potatoes growing nearly

every year since and I believe 1947 was the only year that I never saw potato bugs. I found seven hard shelled bugs but not one larva and they are what do the damage.

Every one who got some of my potatoes last year said that they never ate better potatoes. I have orders for my next year's crop of potatoes.

J. J. Jarvie,
New Kensington, Pa.

—o—

BARREN CLAY MADE FERTILE

September 3, 1947.

Gentlemen:

This is my first garden at this address. The soil was like concrete. Weeds wouldn't even grow. I felt that I had to start sometime,—so I followed the organic methods to the letter —(no chemicals - no sprays), and I have the most magnificent garden. It is beyond anything I expected for the first year. Crops were abundant and of the finest quality. All this from hard, yellow clay plus compost. I also had good luck with young fruit trees which I rock-mulched.

Edith E. Reilly,
Oronoque, Connecticut.

—o—

MY EXPERIENCE WITH ORGANIC GARDENING

Dear Sirs:

In Nov. 1946 my husband plowed with the tractor ¼ acre of ground—sandy loam. It had been farmed for years but not in garden. It had been limed when the lime would reach but no manure. The plowman left the furrows on edge so the moisture could be retained and when Mar' 47 came he harrowed the ground leaving it in fairly good condition to begin garden making. In the summer of '46 I began to be interested in Organic Gardening and proceeded to build two compost piles. I was somewhat "at sea" but laid down some old tomato stakes on the ground and with lawn clippings,

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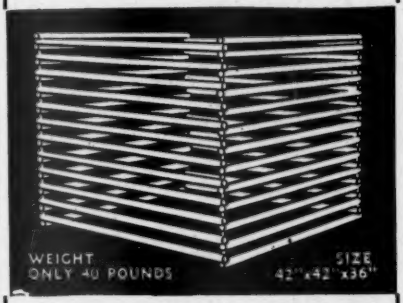

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chicken manure, kitchen waste, ground limestone and some good dirt built two 7 x 4 about 4 ft. high and covered them over closely with soil. Left them flat on top. Wet them when it did not rain enough to keep them moist. In six weeks I turned them and they were heating nicely. In Nov. I had to move them out of way of tractor and in the Spring had nice brown mature compost.

I did not have enough compost to cover entire plot of ground but was anxious to try it on all the vegetables. The ones I planted in rows such as onions, beans, peas, lettuce, carrots and beets I dug a row and put the compost in and covered lightly with soil and planted the seeds. Everything came up nicely and as I worked them I side dressed those I wished to give an extra boost.

In planting the cabbage, tomatoes, cantaloupes, peppers and lima beans (pole) I took a round pointed shovel and lifted out shovel of dirt and put in ½ gal. of compost mixed it with the dirt-set plants and planted the seeds.

I was fearful the tomatoes might drop their blossoms but never had finer ones on stakes six ft. high and the vines two ft. above stakes.

The onions were fine—many specimens weighing a pound and some a pound and a quarter.

I have gardened for years (I am 76 years old) and I never had as much satisfaction from our garden.

The insects were almost "Nil". Just a few bean beetles on late pole limas.

I did not use one spoonful of fertilizer just the compost and it certainly pays. Hard work to turn the compost pile but the returns are sweet.

(Mrs.) A. R. McClintock,
Mt. Pleasant Road.
Greensburg, Pa., R.D. 2.

—o—

COMPOST vs. FRESH MANURE

March 19, 1948.

Dear Sirs:

Ever since World War I, I have had a vegetable garden, with a few flowers scattered among the vegetables. While

living on the farm I had stable and hen manure. But 8 years ago, having sold the farm, I live on a place in the village where I have a 30 x 50 ft. garden; and unable to procure the stable dressing, resorted to commercial fertalizers and latterly have felt there was great need of humus being added, and think your magazine and the free booklet may show the way to get it.

Last season I used sheep manure 100 lb. and the same amt. of droppings from a hennery, the latter was mixed with some straw, and I wonder if that had anything to do with the fact that, the only insect pests were 2 striped cuke. beetles; and a few potato bugs on nicotiana. I never knew tomato plants to go thru a season before without not even one of those big horned worms. (I do not raise potatoes.) I do plant small amounts of a great variety of vegetables, the root crops have not done very well the last two seasons. and there was only one parsley plant, whereas usually it is a real pest.

I am a newly elected President of the local Garden Club, the first meeting of the season is in April, and I am anxious to have my subscription begin as soon as possible.

Yours truly,
(Miss) Ella T. Pearson,
Box 283,
Epping, N. H.

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At BROOKINGS, OREGON

Insects, The Censors of Nature

A paper by J. I. Rodale read at the Soil and Health Conference of the Organic Garden Club of Western Michigan at Muskegon, Michigan, April 19, 1948

A LONG time ago farmers did not use artificial fertilizers, and we have it from great-grandfather farmers that in those days there were not the plagues of insects that are overrunning our farms today. In Biblical times God brought plagues of insects. Today man by his ruthless, destructive actions is bringing them upon himself. While in Florida a few months ago I saw the fear with which the orange-grove owners faced the coming of successive waves of grasshoppers. The Arizona citrus growers are quaking in their shoes because the deadly citrus black fly is on the wing from the interior of Mexico. A battle is being waged right now in that country with the fly on one side and U. S. and Mexican entomologists, farmers, bankers, poison sprays, giant spraying guns and other forces lined up on the other. If the battle is lost the entire citrus industry in Arizona, involving millions of dollars may be wiped out. The Mexican peasant farmers have been educated, in the last decade especially, to farm along artificial, chemical lines and they are suffering not only with the citrus black fly but with hoof and mouth disease on such a colossal scale that it is running into losses of hundreds of millions of dollars.

I was in Arizona last year and saw farming operations which used carloads of chemical fertilizers. A soil so chemicalized, with the unbalancing of its biological forces, is not the proper medium to give health and vigor to trees so as to withstand black flies and other insects. There are dead battlefields also, sections of the country where poisons are pitted against insects, where production was maintained for awhile, but where the land now is dead. I refer to the ex-orchard soils of the State of Oregon that are so defunct that even weeds will not grow there. There is a ghost town in Maine that was ruined because of the continuous application of copper sulphate on its potato crops to war on the ravaging potato bug. In the midst of these battles stands the public, the innocent bystander, a terrible casualty who is forced to eat food raised in soils polluted with poisonous chemicals, whose food, therefore, does not contain the maximum amount of vitamins and minerals.

The farmer not only sprays and sprays but his conscience does not bother him one whit. He goes to church every Sunday. Possibly he is not health conscious; some of them consider the spraying of poisons actually a virtue. Witness a recent advertisement of a farmer who had apples for sale which said, "We spray our fruit trees eight times a season." Years ago when the insect menace was in its swaddling clothes, the farmers would spray once or twice a year. Gradually they raised it to three, four, five. Now it is eight or more. Is not that a sign that the entomologists are losing out in their war against the insect? This poison spray not only accumulates in the soil but is absorbed below the skin of the fruit so that regardless of how much it is washed, some of the poison will still remain in the pulp.

The situation is so serious in the State of Oregon that a law was recently passed enforcing the spraying of every cherry tree in that State, even down to the one pet tree a family might have in their garden. Fewer insects attack cherry than any other tree fruit. The pest most disagreeable to lovers of cherries is the cherry maggot which lives as a small whitish worm in the ripening fruit. They pupate in the ground and can be controlled by having in the orchard chickens which scratch up and eat them. One of the readers of *Organic Gardening* in that State was so incensed that he wrote us to the effect that he had fifty cherry trees and he would chop down every last one of them before he would spray.

The State of Oregon, in enacting this law is guided by the assumption that if there are insects around they will attack all cherry trees. Our militant *Organic Gardening* reader, is building up the health of his cherry trees from year to year by applying compost under them. They will reach a point in two, three, or four years where they will be immune to insect attack, or will be attacked at an extremely low or negligible rate. He might then have a neighbor who has hundreds of trees full of ravaging insects, close up to his, and yet the neighbor's insects will not be a menace to his trees. Why? The answer to that question is the theme of this paper.

Sir Albert Howard has said that the insect is the censor of nature to destroy unwanted vegetation. In the scheme of evolution certainly the insect is no chance accident. Thousands of species have been developed over millions of years. Why did the chestnut trees die out in this country? No one seems to know, but in speculation, is it possible that the trees were growing in the wrong place, in acid forests? A manufacturer of tannic acid that he obtained from the bark of chestnut trees claimed that this tree should grow in an alkaline soil. So the insect or the fungus comes to destroy those trees.

Where the farmer rotates his crops in four or five year periods Nature may do so in cycles of two or three hundred years. Certain kinds of trees that were prolific two hundred years ago in forests are scarce today. The insect is one of the tools Nature uses in this thinning out or liquidating process.

Now, let us suppose that you use a strong chemical fertilizer in growing a plant. There is sufficient evidence to show that the taste of such a plant is affected by doing this. Organiculturists have long known that their vegetables, grown with organic composts only, have a superior flavor from those grown by them previously with artificial fertilizers. Organic gardeners know also that when they garden with composts only there seems to be a great reduction in insect depredations. The answer must be that the insect comes to the plant, samples it and goes his way because it is not to his taste. He will feast on a leaf of a plant grown with chemicals, because it is a sick leaf; not too sick perhaps, but as doctors might classify it, it is in a subclinical state of health. It is a little under the weather and that is the way the insect likes to have his leaf. It is

like many tribes of natives in Africa who by tradition and inheritance relish rotten foods. To them it is a delicacy.

Let us take the case of germs in our own body. Practically every one of us carries the tuberculosis germ in our system. We are safe from its attack if our bodies are strong and healthy, but if we weaken the germ begins to thrive and multiply. A state of weakness is his delight. Insects and germs have been trained by evolution to like certain things. A maggot will not attack live flesh. It is abhorrent to it. But let that flesh die and the maggot begins his feast. This principle was used to great advantage in World War I. Where gangrene set in near bones, live maggots were applied and they cleaned out only the gangrenous, dead tissue. They would not touch the live healthy tissue. While we might like ice-cream, a fly wants a dung pile.

Let me relate an experience that occurred in our hot-house a few winters ago. We planted lettuce and the plants were severely infested by aphids, with the result that they shriveled up and were a total loss. I would not spray, because I would rather eat no lettuce than some that was saturated with a strong chemical. A few months later, on the very same spot we tried lettuce again and the plants were gorgeous. Gone were the aphids. This puzzled me for awhile but the answer suddenly came. The first lettuce started to grow in December. The days were extremely short, the skies cloudy, the plants runty and weak. The aphids were attracted to them and ate or sucked with gusto. The second iot was set out in February. The days were longer and many of them with bright sunshine. The plants grew large and vigorous. No aphids. Many persons have had the experience of bringing a rose plant indoors only to find that it falls prey to aphids, because it has become weakened.

I can give another example of the selectivity in the taste of an insect, the Japanese beetle. We had two grape vines whose leaves spreading over the same trellis mingled and twined together. One was a gnarled old vine of some wild variety. The other was a young Concord only a few years old. Both had been treated with compost, yet the Japanese beetle ate only the leaves of the old plant. It by-passed all of the younger leaves even though they were all packed closely together. The beetle relished the old plant leaves, possibly because the younger vine had been treated with compost since it was first planted. It responded better to it. Its leaves were in a better state of health. Of course it could be that the beetle liked the old vine because it was a wild variety.

This brings up the work of scientists in breeding insect or disease resistant plants. This is *some* help, but it is only a palliative because the resistance does not last. Better concentrate effort on growing any variety of plant healthfully by enriching the soil with organic matter.

A friend of ours who had a place with an abandoned apple orchard, threw the chicken manure in cleaning a poultry house under one tree in an orchard of fifty trees. In a few years it was noticed that this was the only one that bore good apples. The coddling moth and other bad actors did not like this particular tree.

I have watched one particular apple tree in our garden. When we took possession of this place about seven years ago, it was completely mantled with the webs of the tent caterpillar in the spring. Each year it became less and less infested until last spring there was remarkably little of it. With a good dressing of compost each year it has improved markedly in the quality of its fruit. At first there wasn't a single decently shaped apple. They were all eaten up and misshapen. Last year we had about 60% of fine fruit, about a hundred nicely shaped and tasty apples. Isn't this a miracle? We have never sprayed this tree. We have an extensive orchard coming up, planted a few years ago, which should begin to bear soon. This will be a more prac-

tical test. We are not worried about our neighbor's trees. Let his insects fly to our place. They will not tarry.

There is scientific evidence that the activities of insects are intimately related to the state of the soil, its fertility, structure, etc. First may I give an experience of Sir Albert Howard. He was called in to observe a peculiar condition with respect to an eelworm infestation of a potato crop. In this country eelworms are called nematodes and they cause the troublesome rootknot. Sir Albert found that only certain rows were infested. This did not puzzle him. He dug down and showed that wherever there was the eelworm, the soil had a hard pan. In the other places, for some unexplainable reason, the earth was soft all the way down. So we see a case of a peculiar condition in the soil affecting a plant and attracting an insect or a worm.

An experiment is now going on in two plots where potatoes are being grown, one with chemical fertilizers and the other with compost. At the end of the first growing season an equal quantity of aphids was introduced into each section. After a short lapse of time it was discovered that there was a greater infestation in the chemicalized section. A majority of the aphids, in other words, preferred the leaves of the plants grown with chemical fertilizers. In these same plots, the same experiment is being repeated this year. We will await the results with interest. One experiment may be inconclusive or accidental, but over a period of years the result will be more dependable and scientific.

Professor Leonard Haseman of the University of Missouri has studied the influence of soil minerals on insects and his findings were summarized in the *Journal of Economic Entomology* for February, 1946. He states that a better feeding of plants may reduce the insect pests while the latter will attack sickly, undernourished plants. Here is a direct establishment of Sir Albert Howard's idea that the insect could be a censor of Nature. Professor Haseman found that the greenhouse white fly attacked tomatoes only where there was a phosphorus or magnesium deficiency in the soil. The chinch bug thrives and multiplies where corn is grown under conditions of nitrogen deficiency and is known to thrive, says Dr. Haseman, on eroded and poor hillsides. Fertile bottom lands are much less infected. Haseman comes to the conclusion that the indications are "that insects require less of minerals and that they may actually thrive best on shortages of certain minerals." With the compost method mineral shortages are gradually corrected.

Let us really be scientific in this war on the insect. The poison-can method is a sledge-hammer solution. It is not subtle and the insect gradually develops a tolerance for the poison, as has been shown. I know a case where a large greenhouse nursery sued a chemical company because the poison mixture did not control the red spider on roses and the rose grower suffered a huge loss. They had used the same mixture for the two years previously with splendid results, but in the third year it did not work. The company, thinking the spray solution was defective, brought the case to the courts, but in the courts the insecticide manufacturer proved that it was the exact, self-same formula as the mixture of the years before, but that the red spider had become used to it. It had developed an immunity to it.

Another important thing must not be overlooked. Recently I was reading the results of an experiment in connection with insecticide sprays in a journal of a great agricultural college in the West. At the end, there was a statement that the money for this experiment was contributed by a large insecticide company, and it gave its name. Isn't it possible that because the money is forthcoming every year from these large corporations that the scientists take up all their time with this negative aspect of the subject? If they had the money to be completely free in their choice of experiments,

wouldn't they more quickly get the answer to the insect menace question?

The medical records are full of the effects of poison sprays on the health of human beings. I have covered too much ground in this paper already and cannot go into this aspect, but several readers have written us, speculating on the fact that poliomyelitis comes during the season when fruit tree and vegetable spraying is at its height. It is strange that countries like China that do not use poison sprays do not have poliomyelitis. But we must not jump to conclusions.

To gardeners let me say that you will never have it insect free. Plant a little more than you need. Plant some for the insects so that after they get their share there will be more than enough left for you. But never spray a poison on any plant that you are going to eat. And this is one of the benefits of growing your own vegetables every year. You can be sure that they have not had a poison bath. So, continue your victory gardens and it will mean victory over cancer, victory over diabetes, victory over heart disease and possibly victory over poliomyelitis. There is a definite, proven connection between the quality of our foods and our health.

One final point—Much money is being collected these days in every community in the country to be used in research to *cure* cancer, heart-disease, poliomyelitis and many other diseases. Fine. But practically all of this is going in the search for cure procedures. Probably nothing for prevention. But some of these diseases are increasing so fast, that soon there may not be enough physicians to apply the cure, even if it is discovered.

Now here is my suggestion. In all of these collection campaigns earmark half the funds for the purpose of doing research to find a cure. Let the other half go to manufacture compost to be given free to the farms surrounding the city where the money was collected, provided the farmers who get this free compost agree that their crops will be sold for use only in the city where funds came from. So many millions of dollars are being raised today in health campaigns that this could be a significant factor in raising the fertility of the soils on our farms.

I know of one commercial enterprise that is now building a plant which is expected to turn garbage into compost in one day. The experiments have been successful on a small scale. A large plant is now being built which will be ready to function in June or July. Our American engineering ability is bound to crack the problem of furnishing compost at a reasonable price. Such a plant operated in each city would be a boon to the farmer. It would give his soil structure and health. It would alleviate the insect problem.

Citizens of the cities, be a little more discriminating in your own interests. Control your contributed funds, so that your health is protected. Don't depend on cures. Prevent!

J. I. RODALE.

Tracer Elements

From the *Science News Letter* for March 6, 1948 we learn that tracer elements now enable plant physiologists to trace the paths of chemical elements through the plant and the ways they are used in building up the compounds in the plant body. For years the question of whether sugars or starches are the first product of photosynthesis was pondered, only to find that neither is the first product of photosynthesis. It is a product that has not as yet been identified.

The Soil and Health Foundation

THE flooding of many of our river valleys again this spring reemphasizes the urgent necessity of doing something to hold the water on the land where Nature distributes it and where it is needed to grow our food plants, and at the same time to prevent the erosion of our soil which is the very foundation of our agriculture and our civilization. The increased use of the highly soluble commercial fertilizers year after year is directly correlated with the water run-off, the loss of fertile top soil, and the flooding of lowlands thus causing terrific damages to agriculture and industry. These chemical fertilizers cause the humus to be burned out of the soil, destroy the physical property essential to a fertile soil, form hardpan in the soil—conditions which favor the loss of surface water and fertile soil. The loss of fertile top soil and the nutrients which it contains is passed along to crop plants, to food animals, and finally to man like the impact of an engine on one end of a freight train is passed from car to car by a series of bumps. Deficiencies or unbalances in the soil cause degenerate or disease-susceptible food plants which, eaten by our domesticated animals, cause abnormal or otherwise nutritionally unbalanced animals, and likewise degeneration diseases in man. In view of these conditions which are becoming progressively worse each year, it is urgent that the work of the Soil and Health Foundation be launched just as fast as funds become available. As a result of soil erosion we are losing valuable crop land at the rate of 500,000 acres each year, while our population is increasing at the rate of 2,000,000 a year.

Although the Foundation is hardly more than six months old, nearly 500 voluntary contributions have already been made. In each issue of the magazine we have been devoting a page to keep our readers informed of the progress the Foundation is making. We want to make it clear, however, that our readers need not feel under obligation to make a contribution. We want them to do so only to the extent that they are interested and are able. In order that all persons, regardless of their financial status, may share in the carrying out of the purposes of the Foundation, we have purposely not specified definite amounts to be contributed by those wishing to become associate members. Recently we received a contribution of ten cents from a person who is low in cash but who thoroughly and sincerely believes in the necessity of conserving our soil and our health. This person is proud to be having a share in carrying out the purposes of the Foundation, in doing something fundamental and basic to the continued existence of our very civilization.

As funds become available, laboratories, experiment stations, and training schools will be established. Already we have inaugurated experiments concerned with the effects of artificial chemical fertilizers on earthworms and nutrition experiments to determine the possible effects of chemically grown foods on the development of cancer in mice. A description of these experiments and such preliminary results as are now available will be included in the first bulletin which is now in preparation. The first bulletin will appear in June.

Any person or organization of any kind can become a member of the Soil and Health Foundation by sending their contribution to the Secretary, 46 South West Street, Allentown, Pa.

COMPOST . . . .
for the Part Time Gardener . .

By F. HASELBACHER

IN the year 1940 we bought some land here in New York state, and since 1942 we planted vegetables but got nowhere. We planted musk-melons every year because we like to eat them, but the largest we could grow them was the size of an orange. And when July and August came the vines dried off or the squash bugs finished them up.

The same thing happened to everything else we planted. We used chemical fertilizers and all kinds of poison sprays, and I guess they were used also by the previous owner of this land.

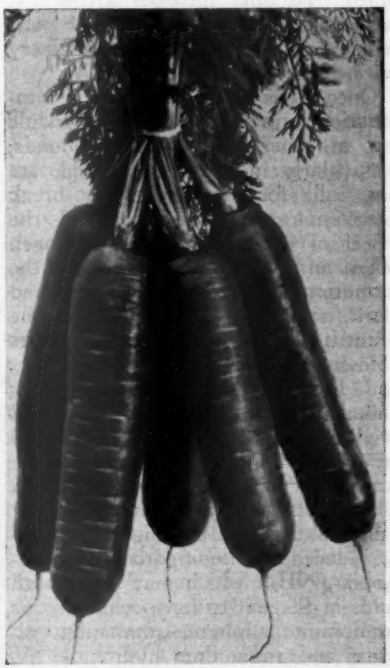
In the fall of 1946, after reading your *Organic Gardening* and *Pay Dirt*, I built a 15 feet long by 8 feet wide compost heap according to Sir Howard's Indore method, and left it that way except that I watered it down once a week for the first month. We couldn't attend to it because I work in New York City, and could go to our country place only once a week. The second week I stuck my hand into the heap and found that it was quite hot. The heap was left alone until the following spring.

In the spring of 1947 we found the compost finished, nice black soil, with a lot of earthworms. I still wonder where they all came from, as we had

not seen any in the soil previously. Anyway, we used the whole heap. We gave each fruit tree a liberal amount, and used the rest on the garden, rock garden, and berry bushes. We got the surprise of our life—the muskmelons weighed from 4 to 5 pounds each. We ate them for 2½ months and never got tired of them. Last year we had none to eat. We noticed only a few squash bugs on the plants, but did not bother with them as they did little or no damage. So the entire garden, including both vegetables and flowers in spite of the unusually dry summer was a mass of vigorous plants free from diseases and pests. We found some aphids on the apple trees but we did not spray them, as we wanted to see what would happen. The 4 to 6 year old trees made new growths as long as 14 inches. The twigs were healthy, the leaves dark green and strong, not yellowish as in previous years. I also mulched the trees with grass cuttings. The everbearing raspberries were amazing and you should have seen my little grandson eat them. The tomatoes were big and good. We had all that we could use and gave many away. The same results were had with cucumbers, lettuce, snapbeans, and squash. We never had so many nice clean snapbeans. We had some bean beetles but they did not seem to like the beans.

From now on we will keep our hands away from chemical fertilizers and poison sprays, because we have seen for ourselves the difference between chemical and organic gardening.

Also our feathered friends came back in large numbers. Last year they built their nests on our place and seemed to enjoy our vegetables and fruits, especially the berries. Evidently the birds can recognize quality in foods.



NITROGEN

By DR. EHRENFRIED E. PFEIFFER

NITROGEN is one of the most important and versatile of the elements in the choir which builds up living substance. Pure nitrogen is an odorless gas which makes up 75% of the air around us. It is so inert that it requires strong forces to make it enter a chemical combination with other substances, f.i. oxygen or hydrogen. A lightning stroke is needed to combine it with oxygen, and then only the most minute amounts are combined. To bind nitrogen artificially, an electric arc of thousands of volts tension and complicated machinery are necessary.

Once it has entered a chemical combination it may stay there for awhile but in general nitrogen compounds, particularly in the organic field, are not built for eternity. They break down more or less easily and the wheel of change goes on. Nitrogen takes an important position in the formation of proteins, animal and plant, amino acids, of many of the beautiful color substances in plants (blossoms), and in animals (feathers and butterfly wings), in narcotics (alkaloids) and sleeping remedies, and in all explosives as well as in the final products of metabolism, urea and uric acid. In short, once it has entered a molecule it is very versatile.

The nitrogen in organisms is usually reduced in decomposition to ammonia (NH_3) which may unite with acids in the soil to form such salts as ammonium sulphate, ammonium nitrate, and ammonium hydroxide. As often happens, the ammonia is oxidized by certain nitrifying bacteria (Nitrococcus and Nitrosomonas) to form nitrite (NO_2) which acts as a weak acid. As a rule the nitrite (NO_2) is oxidized by other nitrifying bacteria (Nitrobacter) to form nitrate (NO_3) which acts as a rather strong acid and unites with bases in the soil to form nitrate salts. The ammonium salts may be used by plants as a source of nitrogen but the acid radicle remains behind and makes the soil acid. More commonly, the nitrogen is absorbed by plants in the form of nitrate salts.

Now comes one of the surprises of nature. While it needs powerful electric forces or lightning to fix atmospheric nitrogen, a peculiar process takes place in the upper layer of the earth, in or near plant roots, where nitrogen is fixed by microorganisms and transformed into nitrates (for a long time supposed to be the only form in which plants can absorb nitrogen) without high tension, powerful voltage, or heat. A biocatalytical process is performed by these tiny organisms to which nothing else in all natural or artificial chemistry is comparable in its efficiency or simplicity. In opposition to the nitrogen fixing bacteria there exist others which break down nitrogen compounds into nitrates, ammonia, and finally free nitrogen (cf. Pfeiffer, "Fermentation versus Putrefaction and Decay," *Organic Gardening*, September, 1947).

The story of the true role of nitro-

gen is only a very recent one. Priestly, the discoverer of oxygen in the air, hints in 1779 that plants may absorb nitrogen. Saussure and Liebig (1839) contested this and thought that ammonia was the only source of nitrogen for green plants. Boussingault, the famous French chemist, published a paper in 1838 stating that plants can absorb atmospheric nitrogen. Thirteen years later he contradicted his own findings. G. Ville, also a Frenchman, proved (1850-1854) that the young Boussingault was right and the elder wrong. He knocked out the theory that ammonia could be the only source of nitrogen, for the increase in nitrogen in the experimental plants was much higher than the ammonia content of the measured air would explain. Now in this red hot fight about nitrogen, a hundred years ago, the squeeze was put on Ville. A commission of seven from the French Academy of Science checked and confirmed him.

Between 1855 and 1860, Lawes, Gilbert and Pugh at Rothamsted, found that laboratory and field experiments did not agree. In the laboratory green plants did not make use of nitrogen from the atmosphere. In field experiments it was demonstrated that plants grew without any nitrogen fertilizer and maintained a certain level of yield throughout the years. It was observed that the N yield of clover and beans was way above that of wheat, barley and mangels, but no conclusions as to the reason why could be drawn. In 1881, the German agriculturist Schultz-Lupitz reported that after 15 years of experiments with lupines without nitrogen fertilizer there was no decrease of nitrogen observable in soil and plants. He spoke of three groups of plants: nitrogen consumers, grains and grasses; nitrogen collectors, legumes, but also mangels, flax and rape; indirect nitrogen consumers, beets and potatoes. Some agricultural chemists had fits about this, but some confirmed the findings of Schultz.

On September 20, 1886 the German Hellriegel gave the historical address in Berlin which opened the way to the solution of the mystery of nitrogen assimilation in plants; namely, through bacteria in the root nodes of a certain plant family, the legumes. The nodule bacteria transform atmospheric nitrogen into nitrates. However, the mystery is—and this is not yet explained—that they can do so without high tension and heat, and how they do it.

Much detailed information has been added since this remarkable discovery was made. Besides the bacteria which live in root nodules of legumes in symbiosis with the host, others have been discovered which live free in the soil without symbiosis. To the first group belong Rhizobium leguminsarum (the name meaning: living on legume roots) and Nitrosomonas; to the free group belong the famous Azotobacter (nitrogen bacterium) but many other bacteria can also fix nitrogen from the atmosphere and build up nitrates. Clostridium pasteurianum can do this and even certain diplococci which are frequent inhabitants of soil. Up to the year 1932 about 1276 papers had been published on this interesting subject.

At the present it is assumed that the Rhizobia live in the soil and are "attracted" by the fine hair roots of germinating legume seeds. They migrate into the epidermis of the host-root through the most minute root hairs. A colony is formed and a sheath wrapped around the bacteria, thus beginning a nodule. In old, mature plants these nodules burst, disintegrate and the soil is reinfected with the bacteria. It has been found that this process is activated by a plant hormone (indolacetic acid). These and related hormones have a transitory existence in soil in connection with the normal metabolism of bacteria and the speedy decomposition of their bodies. The conditions of the soil must be such that a lively bacterial action takes place in the neighborhood of legume roots which evidently are at their best in good humus soil. The concentra-

tion—and here we marvel at another "secret" of nature—of indolacetic acid is not high at all, in fact dilutions of 1:100,000,000 will do best while high concentrates may even have a deleterious and poisonous effect. It is also a fact, which speaks for the beneficial role of compost and humus and against the application of "artificials" that nitrate and ammonium salts will hinder the nitrogen fixing action of bacteria. The gardener and farmer, therefore, has two paths to decide upon, namely, whether he will stimulate nature or chase it away and substitute nitrogen fertilizer for it. The first course is inexpensive but requires an organic method of farming, the second method is expensive and—in spite of everything—depletes the natural, organic, restorative powers of the soil. It is also a well-known but not advertized fact that nitrates impede the development of root nodules and fewer root hairs are formed. You can even read this in publications sponsored by the chemical industry.

A very interesting fact has recently been discovered by Kubo (1939) and confirmed by Keilin and Wang (1945) that a red pigment exists in the root nodules of legumes, f.i. of soybeans, which is nothing else but haemoglobin. These symbiotic root bacteria actually contain a factor which synthesizes haemoglobin. The writer is not carried away by his enthusiasm about this discovery when he points to this fact calling it the real "life blood" of soil fertility at work. The role blood plays in the higher organisms with its oxidation process is carried on here by the nodule bacteria. Carbon monoxide which poisons blood also poisons bacterial and nodule action.

Clostridium pasteurianum fixes nitrogen in the presence of glucose, loses this property on artificial media, but restores it when brought back in contact with soil. Compost, particularly that containing old leaves and fruit, pomace from grapes and apples, contains glucose. The writer has frequently found the bacteria in increasing amounts in well treated compost heaps. Azotobacter is another friend of ours, requiring molybdenum or vanadium as a catalyst—trace element. These trace elements still work, or even work best, in dilutions of 1:1,000, 000, 000, 000 figures of a magnitude to which we are only recently becoming accustomed by regarding the national debt.

It is interesting to realize in this connection that the fertile chestnut soils of Southeast Russia contain their organic matter almost exclusively in the form of Azotobacter bodies, 900 million cells per gram of soil.

Ammonia completely inhibits the nitrogen fixation by Azotobacter. Calcium (lime) on the contrary stimulates these bacteria, unless it is itself fixed by acids, sulphates and superphosphates, for example.

Our laboratory agriculturists have studied these processes in test tube arrangements but most admit that they have not come anywhere near to understanding the complexity of sand, silt, clay mixtures in soil. However, more and more frequently the stand is taken as expressed by J. H. Quastel in an article "The Metabolism of Nitrogen in Soil" in the Canadian magazine *Endeavour*, July, 1947. He states there: "In essence, the attempt has been made to study a soil as though it were a living tissue. Emphasis is given to changes brought about by the *soil as a whole* . . . and care is taken that the soil itself is not interfered with during the experimental period." This point of view, to consider the soil as a whole and as a living organism has been leading the defenders of organic methods for at least the last twenty years and it is gratifying to witness that agricultural science arrives at the same conclusion. Now we read, for instance: "The greater the amount of absorption, the faster is the nitrification." Organic methods have long ago pointed to the greater absorption of soils when compost and composted manures are used. "Nitrifying bacteria grow on the surface of soil . . . the rate of nitrification becomes proportional therefore to the

area of soil surface . . . loss of free nitrogen from the soil is greatly encouraged by poor drainage and lack of aeration," states Quastel.

Whoever has applied organic meththat his soils become more crumbly, ods knows from practical experience thus increase the surface area, drain better, absorb better and decrease the danger of nitrogen losses.

The problem of nitrogen fixation has recently become even more complex, for it has been observed that other plants than legumes can contribute to an increase of nitrogen. As far back as 1922 Lippman and Taylor have reported that the nitrogen balance of wheat was increased by 13 to 21% by making use of atmospheric N. They concluded: "There can be no question, now, however, that the teaching of all our books, and nearly all our teachers on the subject today are erroneous and must be changed completely to accord with the facts." The facts, however, are not very comfortable, for they would mean a complete revolution, or better "evolution" of agricultural science and its application. The facts are that careful experiments have shown that a nitrogen increase beyond the fertilizer school formula could be observed in plants like the Polygonum (knotweed), Fagopyrum (buckwheat), Solanum nigrum (night shade), Curcubita Pepo (pumpkin), Rhaphanus sativus (radish), (Mameli and Pollaci 1909 and 1911), that lupines fixed nitrogen without nodules (Stocklasa). Recently Hugo Schwanderl in Germany has published data which also demonstrate nitrogen increases in experimental plants grown under strict control. We mention out of the wealth of Schwanderl's material only a few. Nitrogen increase in single plant: peas 537; mustard (not a legume) 236; buckwheat (not a legume) 255; oats (not a legume) 737 (!).

Quite a few "weeds" have this property, mainly those belonging to the Knotweed family, but also yarrow and related plants. Achillea millefolium 179; A. filipendula 370; Artemisia, Chrysanthemum, Cichorum species, Sunflower 228; Helianthus rigidus 613. Inula macrocephala excels with 826; Tanacetum vulgare 134; the dandelion (Taraxacum officinalis) 242. Of the Cruciferae some are quite prolific too: Brussel sprouts 233; Brassica oleracea, subspecies acephala, exaltata (Siberian Kale may be related to it) 571; mustard. Some Rubus species, blackberries for instance, Theodor Reinica and Rudloff rank between 237 and 446 while the boysenberry is low (50 to 260).

An entirely new field of study opens here. These new findings are surprising and give us much food for thought. They demonstrate that we are only at the beginning of our knowledge about the nitrogen metabolism in plants. They help to explain some observations which one can make in nature. One of these is that some (not all) abandoned fields, overgrown with certain weeds (some we have mentioned above) do not lose their fertility but are rather sterile when brought back into cultivation. These weeds, as well as plants which are frequently used for green manuring like buckwheat, mustard and rape, thrive best when provided with some nitrogen from compost or manure as a "starter." Once "started" they will continue on their own account. The other observation is better known and is applied in proper crop rotations by alternating nitrogen restoring plants with nitrogen consuming plants. It is only necessary that the principle of this rotation be extended to all crops. A diversified farm management has the advantage here over monocultures or semi-monocultures like the Midwestern habit of growing corn-wheat, corn-wheat in succession. Proper rotations can also be introduced in gardens, truck-vegetable and flower gardens as well.

One thing is sure, the nightmare of the scientific agriculturist about nitrogen deficiencies need not exist under organic management. Our experience has already proved this to a large extent.

The Prevention of Potato Blight

By PROFESSOR W. NEWCOMB, M.D.
St. Mary's Hospital Medical School, Paddington, W.2.

DURING the recent war when a portion of St. Mary's Hospital was moved to Basingstoke, I took over a new bungalow (Syberne) there on a piece of neglected land badly infested with wild mustard and other weeds. The depth of top soil varied from nine inches to three feet over a chalk subsoil.

In 1940 the task of getting the garden into order was begun and by the spring of 1941 it was all dug over in time for planting the first potato crop. During the next four years—1942-45—the cultivation of this crop was continued. The rule followed was to dig in all weeds, to avoid not only the bonfire but also the use of artificials and poison sprays. Reliance was placed on the compost heap to restore and maintain the fertility of the soil and to protect the potatoes from blight.

Compost was made according to the Indore Process in heaps, each 5 ft. by 5 ft. and 4 ft. high, kept in position by sheets of expanded metal as no wire netting was available. All vegetable wastes including potato haulm, leaves, and grass cuttings were mixed with kitchen waste and small quantities of earth and chalk to keep down the acidity. The necessary activator was provided by pumping the contents of the cess pit over the mass and by the use of small quantities of manure from a cow shed, old blood, bones, and other animal residues. The heaps were turned twice.

Each year as much compost as possible was made. Early potatoes were one of the crops grown. They were planted in shallow trenches as digging proceeded and a heavy mulch of compost was applied to the surface between the rows when the new plants appeared. Earthing up was done by drawing this compost, mixed with a little soil, round the plants with a hoe. In this way the material of the ridges was almost pure compost. By 1945 the soil was brought into really first-class condition.

The results obtained in similar plots, each 22 ft. by 13 ft., are set out in the following table. New Scotch seed was obtained each year.

Year	Variety	Weight of Seed in lb.	Yield of Produce in lb.	
1941	Arran Crest	14	99	
1942	Arran Crest	Seed not weighed	78	
1943	Arran Pilot	7	63.5)	116
	Epicure	7	52.5)	
1944	Arran Pilot	7	91.5)	170
	Epicure	7	78.5)	
1945	Arran Pilot	7	163.5)	292
	Epicure	7	128.5)	

It will be seen that as the fertility of the soil improved, the yield in five years rose threefold from 100 lb. to nearly 300 lb.

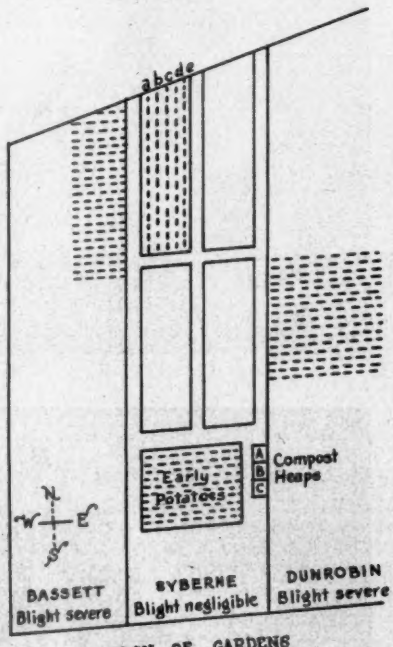
In 1945 severe attacks of potato blight were the rule. The crops of the two gardens on either side of mine were heavily damaged, but, with the exception of three rows of one plot which were not composted, my potatoes were hardly affected. Further, the crop was of excellent taste and quality, and there was no rotting in store.

In this year the blight first appeared in the garden (Bassett) adjoining mine to the west, where the potatoes were planted at the same time as mine but with Grow-More fertilizer sprinkled along each row. The crop in the garden (Dunrobin) on the east side was planted a little later with artificial manure put along the rows before earthing up. In this way the blight-resisting qualities of compost-grown potatoes could be compared with the produce of artificial manuring grown under similar conditions.

Blight first appeared in the Bassett garden on the west, from which the prevailing winds distributed the spores over my plots and those of Dunrobin to the east. With the exception of some plants in three rows of potatoes (b, c, d) which had no compost, my potatoes were to all intents and purposes free from disease, the crop ripening normally with excellent flavour and there was no rotting in store. Even the potatoes from the infected rows, b, c, d, had good taste and kept well. Compared with these results, the crops of both Bassett and Dunrobin were heavily attacked by blight and the yield of potatoes was negligible.

The diagram shows the position of the three gardens and their potato plots, the degree of infection, and the direction of the prevailing wind.

These results suggest that the real cause of potato blight is not the fungus —*Phytophthera infestan*—but the poor condition of the host plant resulting from impoverished soil. The true remedy therefore is not preventive spraying with copper salts, but a high condition of soil fertility brought about and maintained by plenty of high-quality compost.



PLAN OF GARDENS

"SOIL—A Foundation of Health" is a 12-page booklet giving the essence of an address by Arnold P. Yerkes before the Northwest Farm Managers Association, and may be had on request from the Consumer Relations Department, International Harvester Co., 180 North Michigan Ave., Chicago 1, Illinois. This booklet points out clearly the relation of soil to your health and the health of the nation. It is well worth getting and reading thoughtfully.

Courtesy of Burpee

....*New!*

Sweet Pea

named for

June Lockhart

June Lockhart is the name of a new sweet pea. This remarkable sweet pea has been named for one of America's outstanding young actresses, June Lockhart.

Seeds of the new flower will be available to gardeners in the spring of 1949.

The unique color of the sweet pea is described as a golden fawn-pink. The flowers are large, ruffled, many of them duplexed and freely borne on long, strong stems.

This new sweet pea is a selection from a cross be-

Courtesy of Burpee

An arrangement of June Lockhart sweet peas.

tween an early type and a late one. The first generation produced all late flowering progeny of almost the same coloring as the late flowering parent, while the second generation produced the break up which could be expected in accordance with Mendelian law. From the second generation, two early flowering and five late flowering selections were made, although the new color had not yet put in its appearance.

In the third generation the two early flowering selections were outstanding and every seed from them was saved for the following generation. From this, the fourth generation, came one plant which was observed to produce flowers different from all the others. This plant was caged and the seeds carefully picked for planting the next year. However, this generation proved not to be true, and two plants were reselected. Finally, in 1946, the breeding appeared to be true and the plant has been breeding true ever since.

Courtesy of Burpee

Actress June Lockhart with a spray of sweet peas named in her honor.

Water Hyacinth as a Mulch

By H. S. RICHMOND

I HAVE been doing quite a good deal of work with organics and have the benefit of personal counsel of a scientist who is also a practical farmer of outstanding success.

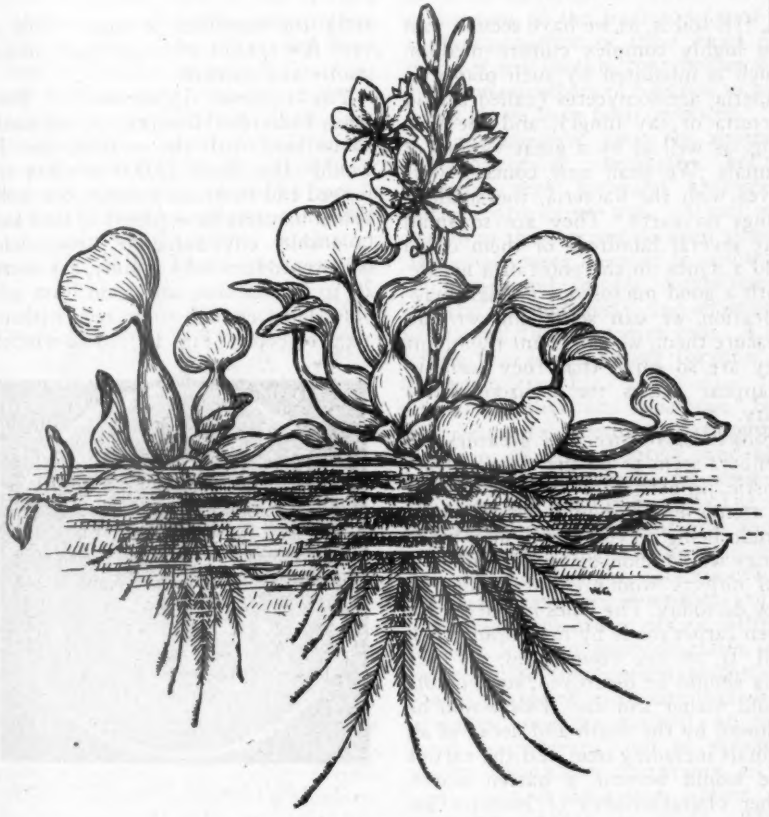
The use of water hyacinth is not entirely original with me as a number of others appear to have used it. My plan of harvesting it, however, has a great advantage over other more simple ones. The expense of collecting water hyacinth may be greatly reduced by 1) gathering it by mechanical means, and 2) cutting down trucking costs by a factor of 6 or more by allowing the material to dry before transporting it. I have gathered water hyacinths from various localities by hand methods. Under favorable conditions the plants may be hauled up on the shore at the rate of 3 cubic yards per hour by one man with hand tools. With simple mechanical equipment, harvesting should be many times more economical. When spread as mulch, the plants will dry out to a feathery fluff, but if placed in a pile the material will sink down and rot, forming a dense heavy mass. In three or four months, the pile will shrink in the ratio of something like 1 to 7.

It is my plan to haul the hyacinths from the water to the shore by simple machinery, and leave them there for three months or so to shrink. The residue will then be mixed with a suitable amount of lime, limestone, or dolomite for sweetening, and then spread on the grove in the orchard. I have talked with a grower who went to the trouble of gathering hyacinths and trucking them a considerable distance, spreading six inches deep over the grove. He was enthusiastic about the beneficial effects upon his trees.

Although water hyacinths contain considerable amounts of nitrogen, potash, and other minerals, they have the additional advantage of being in organic form. Also when used as a mulch, they shade the soil, retard evaporation, and conserve the soil. In time they are transformed into humus and contribute in a cumulative way to soil fertility of the future. Elements in organic form in the soil are much less subject to leaching. It is becoming recognized that organic humus-forming materials are of great value in producing strong trees and superior fruit, and at the same time in fortifying them against the attacks of diseases and pests. The presence of humus in the soil may be regarded as an index of its fertility. The chief difference between a barren and a fertile soil is usually a difference in humus content, not in mineral ingredients. It is also becoming generally recognized that many soils are becoming deficient in humus and humus-forming organic matter so that we are in danger of losing the remainder of our fertile soil. Plant hyacinths is a source of organics easy to obtain, but it is being destroyed instead. The matter

is urgent as there is much experimental activity throughout the state (Florida) directed towards the disposal of these plants by poisoning so that they will no longer be available. It is to be hoped that the poisoning will be discarded and the plants be controlled by gathering them up on the shores as sources of organic fertilizers.

For harvesting, a portable conveyor something like that used in sawmills for piling sawdust might be used to good advantage. The lower end would be in the water and the upper end on the shore. Labor would be used to guide the floating hyacinth plants on the conveyor. The off-shore plants could be gathered in by the use of a floating chain.



WATER HYACINTH PLANTS

BOTANY for the GARDENER (8)

By Dr. WILLIAM H. EYSTER

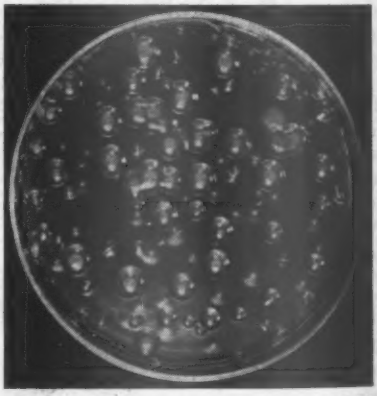
The Plants in the Soil

BACTERIA

THE soil is, as we have seen, a vast and highly complex culture medium which is inhabited by such plants as bacteria, actinomycetes (called thread bacteria or ray fungi), and the true fungi as well as by a great variety of animals. We shall now concern ourselves with the bacteria, the smallest beings on earth. They are so small that several hundreds of them could hold a dance on the point of a needle. With a good microscope of high magnification we can see them, we can measure them, we can count them, but they are so small that they seem to disappear across the horizon of infinity.

Smallness of size and greatness in numbers seem to be the most characteristic properties of the bacteria. If an atomic bomb should destroy every human being on this earth, man-made things would soon disappear but natural objects would endure about as they do today. The holes in the earth's green carpet made by man would soon heal. If, on the other hand, all bacteria should be destroyed, soon plants would wither and die. This would be followed by the death and decay of all animals including man and the earth's face would become a barren waste. Other characteristics of bacteria are their omnipresence, their rapid reproduction, their capacity to decompose vast amounts of organic matter without being seen, and their ability to become dormant when environmental conditions for their growth are not favorable. For the most part, bacteria are beneficial to man. Only a very few species are injurious to living plants and animals.

The General Appearance of Bacteria. Individual bacteria are too small to be seen with the unaided eye. It would take about 25,000 of them arranged end to end to measure one inch. When bacteria have plenty of food and favorable environmental conditions they reproduce very rapidly, say every 20 to 30 minutes, and soon form colonies large enough to be seen without a microscope. (Fig. 19). The whitish scum on the surface of vinegar is made up of billions of acetic acid bacteria. This scum which gradually settles to



—Photo from U.S. Bureau of Plant Industry.

FIG. 19

Bacterial colonies in a culture medium. Each spherical colony is made up of millions of individual bacteria.

the bottom of the barrel as a slimy mass is called *mother of vinegar.* The appearances of bacterial colonies on culture media vary with the different species. Some are white and smooth, some white and rough, and others with colors varying from cream to yellow and deep red.

Although individual bacteria were first seen by Leeuwanhoek as early as 1683, it was not until 1872 that Ferdinand Cohn introduced the name *bacteria* and described methods of culturing artificially these smallest of all plants. The plant body of the bacteria consists of a single cell or sometimes a chain of cells. The cells vary from about 1/25,000 of an inch to the lower limit of microscopic visibility in length and may be much shorter. Some have the shape of a short rod (*Bacillus forms*), as in Fig. 20 A, and may or may not have cilia (hair-like motile organs). Others are spherical in shape and usually cling together in clusters as in Fig. 20 B. These are known as

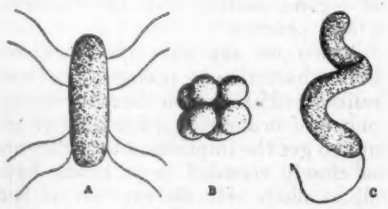


FIG. 20

A—Bacillus type; B—Coccus type; C—Spirillus type

coccus forms. Still others are spirally shaped rods which have serpentine movements and may or may not have cilia. These are called the *spirillus forms.* (Fig. 20 C). The cells of many bacteria have a gelatinous sheath which, in colonies, fuse to form what is called a *zoogloea.* The mother of vinegar is a common example of a zoogloea. To facilitate the study of individual bacteria, various stains and special microscopic techniques are used by the bacteriologist.

The Reproduction of Bacteria. The bacteria reproduce only by division. Under favorable conditions they grow and reproduce with surprising rapidity. In some cases it requires only 20 minutes for a young bacterial cell to grow to maturity and divide to form two new individuals. It has been estimated that a single colon bacillus, if optimum conditions could be maintained so that a new generation be formed each 20 minutes, would in eight days form a colony having a mass greater than that of the entire earth. As a matter of fact, however, under natural conditions, the processes of growth and reproduction are slowed down or interrupted entirely by the exhaustion of the food supply or by the accumulation of toxic waste products of metabolism long before such enormous numbers of bacteria as indicated above have been produced.

Many bacteria, upon the approach of unfavorable conditions, become dormant and surround themselves with a protective wall. A cell protected in this manner is called a *spore.* Bacterial spores are able to withstand the most unfavorable conditions of moisture, temperature, and substances which kill the vegetative cells. A few of the disease-producing bacteria are shown in Fig 21.

Soil Climate and Bacteria. Such environmental conditions as acidity, aeration, moisture content, and temperature together make up what we may call the "soil climate." The soil climate differs in different soils and in different levels of the same soil. With the exception of light, bacteria require about the same environmental conditions as any other plants. Bright light is fatal to many bacteria, and especially to the bacteria of the soil. For each kind of bacterium there is an optimum moisture content, an optimum temperature, and an optimum acidity. With few exceptions, all require organic substances (plant and animal residues) as foods. Many bacteria require oxygen from the air and are called *aerobes* or *aerobic bacteria.* Others can live only in the absence of atmospheric oxygen and are called *anaerobes* or *anaerobic bacteria.* It is because the organisms

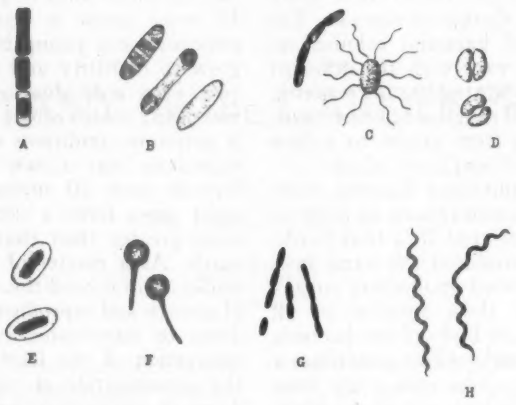


FIG. 21

Disease-producing bacteria are commonly referred to as pathogenic bacteria. The disease caused by each of the bacteria here shown are A, anthrax; B, diptheria; C, typhoid fever; D, meningitis; E, plague; F, lock-jaw; G, tuberculosis; H, syphilis.

which break down the plant and animal residues in the first stages of composting are *aerobes* that the heap must be well ventilated. Without air these organisms cannot grow and reproduce. In making compost also the other conditions of soil climate must be made favorable for the organisms of decomposition.

Bacterial Foods. Bacteria, like all other organisms in the soil, must have organic substances, plant and animal residues and their dead bodies, as foods. Their capacity for food is amazing. A lactic acid bacterium can eat twice its weight in sugar per hour, while a urea bacterium consumes 100 times its weight each hour. The soil contains bacteria for the decomposition of all kinds of organic matter. Soil bacteria consume organic matter in the soil much like a flame consumes organic matter in the air. As the amount of organic matter increases, the number of bacteria increase and rapidly consume the food and convert it into energy and plant nutrients. When the food has been consumed, the bacteria become quiescent and inactive like the dying down of a flame after the combustible matter has been burned. Adding anything to the soil which will hasten the burning up of organic matter must be considered a bad practice.

When we say that there are five billion bacteria in a teaspoonful of sour milk or 350 million bacteria in an ounce of ordinary garden soil, we are apt to get the impression that they are so closely crowded as to hardly have elbow room. Hardly ever do we find more than about 300 billion bacteria in an ounce of food-containing substance. If they were uniformly distributed they would not be crowded as much in proportion as are many of our apartment houses or our large department stores on a sunny shopping day before Easter.

To make food substances soluble, bacteria give off digestive enzymes very much like those given off in the digestive tract of man. A dead cabbage leaf or a potato tuber is digested in the soil in about the same way as it is in the digestive tract of an animal. The digested foods are absorbed in the same way that a wilted lettuce leaf absorbs water. We may regard the soil, therefore, as a vast digestive system in which some bacteria digest

sugars, some the material which cements the cells of a plant body together, some cellulose (cell wall), some lignin (wood), some proteins, and a few attack fats though not very successfully. By acting together different kinds of bacteria take a dead plant or animal body apart and prepare the chemical elements for use in building new plants in the same way as different kinds of laborers take an obsolete building apart and salvage the materials for the construction of a new building.

Bacteria in Plant Nutrition. The organisms of decay reduce the carbohydrates to various organic acids or to water and carbon dioxide, proteins to ammonia and other nitrogen compounds, and the fats to glycerol and fatty acids. These substances are then further changed by various specialized soil bacteria into compounds that can be utilized by green plants. It is interesting to point out in this connection that often bacteria effect some change in a substance and then turn it over to other groups of bacteria to effect other changes, as in a dismantling factory an object may be placed on a moving belt, and carried from one set of workers to another. For example, proteins move along from one group of bacteria to another until they finally are reduced to ammonia. Ammonia is changed by another group to a nitrite, and the nitrite by still another group to a nitrate. Another example of a series of changes that are produced by different kinds of soil organisms is fruit juice (sugar) is changed by yeasts to carbon dioxide and alcohol, and the latter is changed into carbon dioxide and acetic acid by acetic acid bacteria. Or take starch that is changed to sugar by certain molds in the soil, the sugar is then converted into alcohol by yeasts, and the alcohol to acetic acid by bacteria. The changes concerned with some of the more important elements in the nutrition of green plants will be discussed briefly in the following paragraphs.

Nitrification. The nitrogen which is bound up in dead plant and animal bodies is finally released, as we have seen, in the form of ammonia by the organisms of decay. Gaseous ammonia would soon diffuse into the atmosphere and thus be lost to the soil and be unavailable to plants, but it combines with other substances in the soil to form ammonium salts, or is oxidized by certain bacteria to form nitrites and finally to nitrates. In dilute solutions, ammonium salts may serve plants as a source of nitrogen, but in their utilization acids toxic to plants are formed. These acids can be neutralized by the soil itself in some cases or by the addition of such substances as ground limestone or dolomite. Most of the ammonia, however, is oxidized by a group of bacteria called *Nitrosomonas* into nitrites, and the nitrites in turn are oxidized by another group of bacteria called *Nitrobacter* into nitrates. These two sets of changes together are called *nitrification.* Nitrates are highly soluble and must be used by plants rather soon lest they be lost from the soil by leaching.

Nitrogen Fixation. Although approximately 79% of the air is gaseous nitrogen, it is unavailable to plants until it is changed into a nitrogen compound. The changing of atmospheric nitrogen into nitrogen compounds is called *nitrogen fixation,* and is brought about by 1) electrical discharges in the atmosphere, 2) soil bacteria, and 3) bacteria which live symbiotically with higher plants.

Electrical discharges in the form of lightning or an electrical arc cause small amounts of the nitrogen in the air to combine with oxygen. The resulting nitrogen compound is then washed out of the atmosphere by the rain and thus reaches the soil.

It has been known for a long time that lands fallowed for a long time tend to become richer in nitrogen. This is caused by the fixation of atmospheric nitrogen by soil bacteria. The *Azotobacter* live aerobically on carbohydrates in the soil and fix relatively large amounts of atmospheric

nitrogen. These bacteria are common in well drained soils having organic matter. *Clostridium*, another bacterium, lives anaerobically on sugars and also fixes atmospheric nitrogen. These bacteria occur in poorly drained soils. The nitrogen compounds fixed by these bacteria are then changed into nitrates by other soil bacteria and thus become available to higher plants.

Atmospheric nitrogen is also fixed by nitrogen-fixing bacteria which live symbiotically in the tissues of some of the higher plants, particularly in the roots of legumes. These bacteria, belonging to the genus *Rhizobium*, represent different species which associate themselves with different species of legumes. The bacteria enter the root through the thin-walled root hairs and form colonies in the root cortex. As a colony grows, a tubercle is formed, as shown in Fig. 22. In the

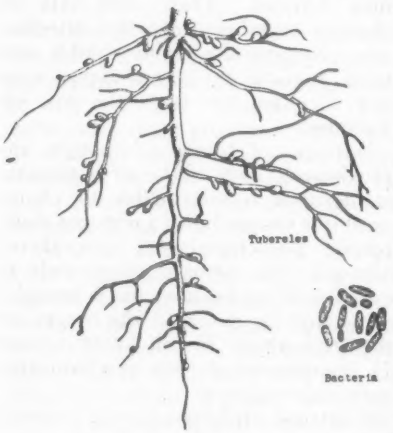


FIG. 22

A root of white clover showing tubercles caused by nitrogen-fixing bacteria (*Rhizobium trifolii*). At lower right are shown a number of individual bacteria having the shape of small rods.

early stages of the symbiosis, the bacteria nourish themselves at the expense of the legume and frequently markedly reduces its vigor. After a time the bacteria are reduced in number and become modified into *bacteroids* which eventually die and are digested and absorbed by the legume. Eventually this nitrogen becomes a part of the soil. Legumes are included in crop rotations to build up the nitrogen content of the soil.

Denitrification. Some bacteria actually unfix the nitrogen by breaking down nitrogen compounds so that the gaseous nitrogen again escapes into the air and is lost from the soil. Such bacteria are called *denitrifiers*. These bacteria require large amounts of food and develop best in the presence of fresh plant and animal residues. Because of this it is bad agricultural practice for a farmer to plow under nitrates with green manure crops. Partly decayed manure or compost can safely be plowed under with a green manure crop without danger of denitrification. In poorly drained soils where there is a deficiency of oxygen, some bacteria get the oxygen they need from soil nitrates and liberate gaseous nitrogen. Proper drainage will prevent this nitrogen loss from the soil.

Sulphur Bacteria. The sulphur which is bound up in dead bodies and residues is converted into hydrogen sulphide as an end product of decay. Hydrogen sulphide is then oxidized by sulphur bacteria into sulphuric acid which unites with bases in the soil to form soluble sulphates. In this form the sulphur is absorbed by green plants as a nutrient element.

Phosphorus Bacteria. The mineral phosphates of the soil are rendered soluble through bacterial activities. These soluble phosphates are taken up by the higher plants and deposited either as organic or inorganic phosphorus with the plant tissues. The animal gets its phosphorus by eating plants. The excreta of animals always contains both organic and inorganic phosphorus. The inorganic phosphorus is readily available to plants again, but the organic phosphorus in plant and animal residues must be mineralized by bacteria before it can be used by plants. The bacteria split off carbonaceous materials and the phosphorus is liberated mainly in the form of phosphates. Phosphorus may 1) re-

main in the soil in insoluble form, 2) be taken up by growing plants and be removed from the soil by bad farming practices, or 3) be leached out of the soil by water and carried off to the sea. It has been estimated that we empty 176,000 tons of phosphorus in the sewers annually, and enough phosphatic material is leached out of the soil and carried to the sea each year to fill a freight train with tricalcium phosphate stretching from Boston to Seattle.

Nature Restores the Losses in Elements in Various Ways. We have seen how losses in nitrogen are made good by electrical charges in the atmosphere, by nitrification, and by nitrogen fixing bacteria. The phosphorus which is carried into the sea is absorbed by the plankton and gradually built up in the bodies of larger and larger sea animals and is again deposited in great quantities as guano or as extensive deposits of the bones of the vertebrates of the sea. Many of the other essential elements have cycles much like those described for nitrogen, phosphorus, and sulphur. Nature also pulls up from the subsoil many of the minor or trace elements. Deep rooted trees, as oaks, and herbs, as alfalfa, absorb minerals from the subsoil and deposit them on the surface where they become available for the shallow rooted plants. Nature provides for all things, if only man would adopt practices which are in accordance with Nature's Laws.

(EDITOR'S NOTE: The next article in this series will be concerned with the actinomycetes which are commonly called thread bacteria or ray fungi.)

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Foundation Planting

By LAWRENCE C. LEMMON

FOUNDATION planting is a landscape treatment which is characteristically American. While the European home is shielded from the public gaze by a heavy continuous planting near the street, the American home is open to view more often than not. The resulting openness of view and proximity of plant materials to architecture requires a degree of planning skill and a choice of plant materials hardly necessary when the house is hidden from view.

To observe that skill has been lacking in many cases is but to state the obvious. The choice of plant materials has been quite often determined by a price tag instead of essential fitness for the purpose. In many cases planting has been carelessly done and maintenance has been nil.

Although foundation planting has more to do with the American domestic scene than any of the other branches of landscape architecture, and represents more in total capital outlay than all our city parks, it seldom receives more than passing attention

FIGURE ONE

Spiraea and upright Japanese yew make a pleasing combination in a foundation planting. The spiraea gives the planting a definite accent in spring, while the yew forms a sharp contrast with the white spiraea flowers and gives color to the planting during the winter months.

FIGURE THREE

The climbing roses and other shrubs used as foundation plants may be merged gradually into the perennial flower bed. For best results, full light is desirable.

FIGURE TWO

Foundation plantings should harmonize with the building and echo some of its characteristics. A tall cedar will tend to give height to a squatty building. Windows must not be "planted out."

from the professional planner. Planning, if there is any, is done by the home owner himself.

With this thought in mind, it becomes the purpose of the writer to set forth a few points worth remembering when contemplating the planting of a foundation. Before attempting a plan we should know something of the purpose of foundation planting. What should our planning achieve? First the foundation planting should connect the house with the grounds. For example, a new house on a lot devoid of planting has no feeling of permanency. In one's mind it can easily be shifted from place to place on the lot or removed entirely without any great disturbance. That same house and lot properly tied together with a good foundation planting becomes an organic whole. Stability and permanency are reflected and a resultant moral value is added to the community.

Second, the foundation planting should enhance and soften the lines of the house just as a veil enhances a woman's features. Every architect recognizes this fact when he adds a suggestion of trees or shrubbery to a drawing prepared for the approval of his client.

Once we know what it is that we are trying to achieve our task resolves itself into four parts. They are: 1. Planning, 2. Materials, 3. Planting and 4. Maintenance.

In planning the foundation planting, one should first decide whether conifers, broad-leaved evergreens, or flowering shrubs should be used. Each has its merits.

Conifers, when handled properly, give a rich year 'round effect. Many tall, slender conifers are especially good where accent is called for, such as for flanking entrances, at corners and recesses in the wall. Then

too there are low spreading conifers for beneath windows where their growth will not obstruct the view from indoors. It should be remembered however that this group of plants suffers from the depredations of dogs. Many conifers grow into large forest trees and should never be used close to the house as they soon outgrow their original allotment of space and become crowded and moth-eaten in appearance. The Retinosporas are an example of this error in planning to be seen on every hand. Most nursery catalogues indicate the average ultimate height of the trees and shrubs listed. In planning, it is quite important to consider how large and how rapidly a plant will grow before attempting to use it.

Broad-leaved evergreens reflect a luxury and character not attained by other materials. However, as they are in the ericaceous family, they require an acid soil and a northern exposure to do their best. Unless you are prepared to meet these requirements you had better not consider planting broad-leaved evergreens.

Flowering shrubs, although deciduous, generally make the most satisfactory foundation planting for several reasons. They are much easier to handle, less expensive to purchase and they possess greater variety in color and texture. They can be pruned and kept within bounds much more successfully than the evergreens. Then too, they have a glory in the spring which is not possessed by the more conservative evergreens.

When it has been decided whether the planting shall be evergreen or deciduous, the next step in planning is to put your ideas on paper. Make a simple scale drawing of the area which is to be planted. This can be done with a pencil, a piece of paper and a ruler. Measure the dimensions of the area to be planted and the size and position of windows and doors on the first floor with relation to the limits of the foundation. Now plot these dimensions on paper at one quarter inch to the foot. Select your plants with an eye to building up the corners and doorways in height and mass, and to reversing the process under windows and along wall sections. The planting may be broken in places along the wall to show where wall and earth meet. The character of the plants will determine the distance they must be set apart. For example, the creeping juniper will require more space than the Irish juniper which is tall and slender. To space a planting properly, one must be familiar with the plants which he intends using.

When your sketch has been completed to your satisfaction it should be taken to a reliable nurseryman in your neighborhood for his comments. With a plan in hand you are able to deal with the problem concretely. The nurseryman's advice can be specific. This will prove of great value as there will be no need for generalities when both you and he know the objective. You should know, before visiting the nursery, something of the color scheme which you have in mind. Whether the soil conditions are moist or dry, clay or sand should be kept in mind. Then too, you should know the habit of growth of the plants. Are they prostrate or erect, open or dense, coarse or refined? You should also know whether they grow slowly or rapidly. Many of the answers to these questions can be learned from nursery catalogues and from books which are available at your nearest public library; others you will have to get from your nurseryman.

When you are in possession of the answers to these questions, you are prepared to select your plant materials with a sure hand. In the meantime you should begin preparing the planting beds. In the case of a new house, be sure all plaster, brickbats and construction wastes are removed from the area about the house. If there is no top soil present, as is generally the case, remove the subsoil to a depth of a foot or more and substitute good rich top soil. To this topsoil, add a generous supply of finished compost,

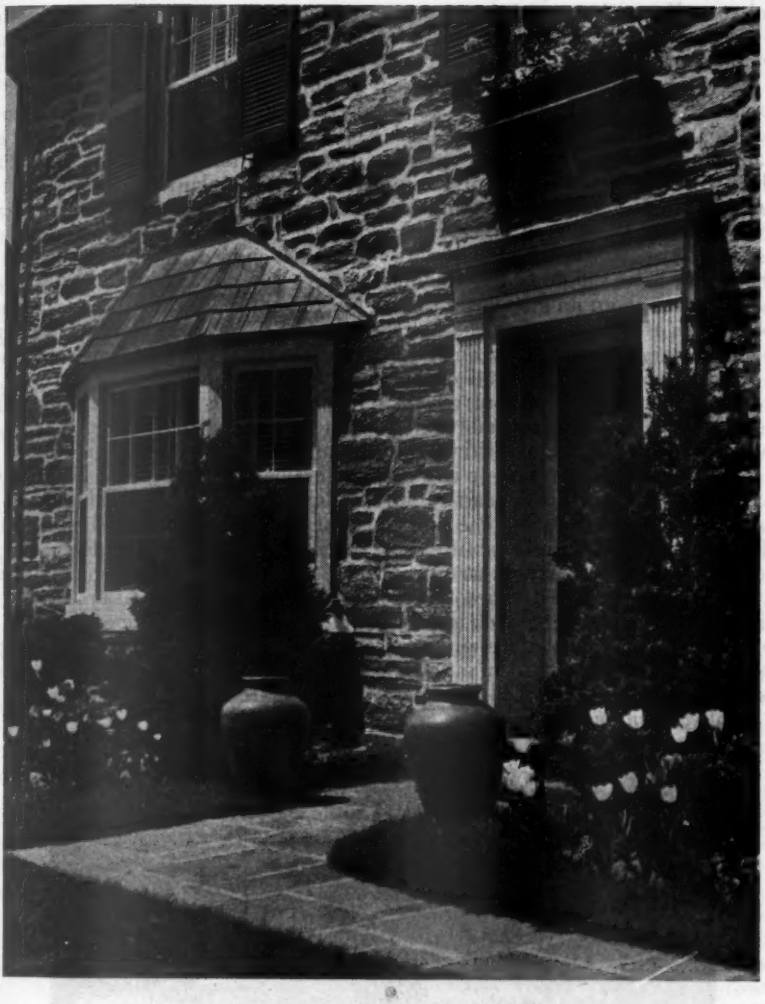

Figure Four

Pyramidal yews, cedars, and other upright conical or columnar evergreens are excellent for accenting entrances, and corners of buildings. Use the spreading types below the windows. Among the evergreens may be planted crocus, snowdrop, and scilla for earliest blooms, hardy native tulips for somewhat later, and then the cottage and Darwin tulips to bring spring to your door.

stirring it in thoroughly 6 inches deep.

When the plants arrive from the nursery, get them set out as promptly as possible to avoid exposure to wind and sun. Keep plants with bare roots covered with wet burlap until you can get them into the ground. In the case of evergreens and plants which are purchased balled-in-burlap, it's a good idea to set them about as you had planned before digging your holes. This will allow you to shift them somewhat and get the best composition possible. When you have them just as you want them they will mark where your holes should be dug. Plants should be set about an inch lower than they sat in the nursery and the holes should be large enough to accomodate the roots, when they are laid out in their normal position, without crowding. When replacing earth, add water and puddle the roots by lifting the plant up and down an inch or two so that the soupy mixture of earth and water flows freely about all the roots. This procedure helps re-establish the plant in its new environment as quickly as possible. The best time of year for transplanting nursery stock is early spring and late fall while plants are dormant and the earth is in satisfactory condition to be worked.

Finally, maintenance should be considered, as, with living things such as plants, there will always be change. More good plantings go wrong for lack of care after they are planted than for any other reason. Spring flowering shrubs should be pruned after they have bloomed, while summer and fall blooming plants should be pruned in February. One should always keep a plant within bounds, since, once let go, it is very difficult to remedy the situation. When a plant has been let go too long and becomes leggy, it had better be dug out altogether. The conifers may be clipped and controlled to a certain extent. This is done by clipping the new terminal growth each spring. Broad-leaved evergreens do not take kindly to pruning, but since they grow quite slowly they don't need so much attention from this standpoint.

If your planting is to look its best at all times, the soil fertility must be maintained. This can best be done by mulching your new planting heavily. Renew the mulch from time to time after digging the old mulch into the soil. By this practice, you maintain the soil in ideal condition. Bacterial life and earthworms are encouraged to multiply, bringing with them all the conditions which the plant roots need to stimulate healthy growth.

ORGANIC GARDENERS' DIGEST

By DR. WILLIAM H. EYSTER

COVER CROPS FOR TRUCK SOILS

Vegetable growers are being faced more and more with deficiencies in the soil because they do not practice the Law of Return. The productivity of truck soils may be stepped up by the regular growth of cover crops, some of which should be deep-rooted. One of the best from the standpoint of yields of dry matter is crotolaria, a crop that also has the advantage of being something of a control of nematodes. An overgrowth of nematodes must be regarded as a kind of "unbalance of the soil." A grower should either plan a regular system of rotation or he should turn under a green manure crop at some time during each year when he can get a long enough break between the vegetable crops.

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ERODED TOPSOIL IS AMERICAN FOOD

At the present time there are approximately three acres of cropland for each person in this country, but more than 500,000 acres of land are being lost each year through soil erosion. According to soil experts, no less than 107,000,000 acres of once fertile soil are in or are nearing a critical stage of deterioration. Another 100,000,000 acres are losing their fertility at a slower but nontheless a considerable rate. Food has always been abundant in the United States and has accounted for only about 24 per cent of the spending personal income. This has left 76 per cent for other things, including those things that have raised the standard of living on such a high plane. We see how precarious life is in other countries where the supply of foods is inadequate. History tells us that entire nations disappeared as a result of the depletion of soil fertility. It is estimated that by 1952 our population will be saturated so far as our food supply is concerned. By 1990 our population will be from 165 to 175 million and unless we can change the trend of soil erosion, we will be in real difficulty so far as an adequate food supply is concerned..

In spite of all these facts, we have no land policy to cope with the situation. We destroyed in a most wasteful manner our great forests, much of our prairie land, and are just now finishing up many of the natural resources in the earth. We desperately need a land policy that will prevent further soil erosion, help to reclaim our already depleted acres, and thus to prevent the human erosion that is sure to follow the loss of soil fertility.

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PLANTS NEED BALANCED RATIONS

Like animals, plants also need balanced rations. If a plant has too little of some elements, it often exhibits such abnormalities as stunted growth, a dwarfing of the stem and crinkling of the leaves, loss of the green coloring between the veins in the leaf, the dying of the leaves, and many others. These abnormalities are sometimes called "hunger signs." If a plant has too much nitrogen and too little phosphorus, it will become leafy but will produce few or no seeds. Such plants also have poorly differentiated tissues

and are very apt to lodge before they ripen their seeds. Potatoes, likewise will go to tops and produce a small and inadequate root system. In making soils Nature was a bit stingy with phosphates. To make up for this deficiency it is a good practice to add ground phosphate rock. With nitrogen, nature provided plants with a generous supply in that the nitrogen of the air can be tapped through the medium of certain soil bacteria. However, cultural practices must be followed which make conditions in the soil favorable to these organisms. One of the most important roles played by the humus in the soil is that of a trader which exchanges the acids formed by the roots for the nutrient elements available in the soil particles. Compost sees to it that the plants get all the elements in just the right amounts so that plants really get "balanced rations."

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WEED KILLERS ARE PLANT KILLERS

It is not uncommon to see in our large daily papers such statements as, "By 1960 all weeds will have been eliminated." This would be tragic, if true. Why kill the weeds? Are not some weeds beneficial? Weeds are Nature's plants for taking over wastelands and holding soil that would otherwise be carried away by wind or water. Many deep-rooted weeds absorb essential elements from the subsoil and deliver them to the surface where they become available to our food plants. Many weeds are important soil indicators. They tell you what to do with the soil. Sheep sorrel, for example, tells you that your soil is acid. Moss on the soil is an indication that it is deficient in certain elements necessary for good plant growth. Destroy all the weeds, and you destroy the fertility of your soil.

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BURNING STRAWSTACKS IS A CRIME AGAINST THE SOIL

One of the most stupid practices in agriculture is the burning of strawstacks, "spoiled" hay, weeds, and other plant materials. It is not long ago that it was fashionable for the wheat farmers of the great wheat-growing states to set fire to the straw stack on the first night after the threshing was finished. This practice is in direct violation of the Law of Return, and someone is being faced with Nature's reaction to this crime. Wheat farmers are beginning to realize that their soils are deficient in humus. More recently soybean stalks are being burned in spite of the fact that they decompose readily and can easily be converted into soil-enriching compost.

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KALE AS A COVER CROP

C. M. Blake of Crown City, Ohio considers Siberian Kale to be a cover crop with certain outstanding advantages and especially adapted for combatting erosion of cultivated lands. Seeds sown after the last cultivation of corn and other row crops or even late in the fall will make a lush vegetable growth to plow down in the spring. Growing this plant as a cover crop may be regarded as a good cultural practice because it represents a form of *mixed culture* and the deep-rooted kale plants absorb trace elements from the subsoil and deliver them to the surface layer in the composted vegetable matter. Roots have been excavated to a depth of five feet, where they were broken off in handling. The plants grow continuously during all except the coldest days of winter, and the stems and leaves as well as the roots decompose rapidly when worked into the surface layers of the soil.

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CORN IN MIXED CULTURE

According to MOTHER EARTH Captain J. M. Boubray from South Rhodesia, an occasional contributor to the *Organic Gardening Magazine*, Indian corn is greatly benefited by interplanting it with legumes. Captain Moubray says, "I am doing some experiments on the interplanting of legumes with maize, and if something has not gone wrong am getting somewhat startling results. Maize grows

very quickly, and at something over a month the maize plants interplanted with soya, American clover (Melilotis alba), and lucerne are nearly twice the height of the control. It appears quite evident that legumes exude or excrete nitrogen, probably in the form of amino-acids, from birth."

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VITAMIN C CONTENT OF WILD GREENS

Many wild greens or common weeds are edible and fit for human consumption, and indeed in pioneering communities the use of these materials for food has not been infrequent. A current interest in certain of the edible wild greens has been revived in connection with a search for local foods suitable for addition to the diet, and Murray and Stratton (*J. Nutrition* 28, 427 [1944]) have determined the vitamin C values for ten different wild greens. For purposes of comparison, spinach was used as the standard reference material; spinach contains 0.5 to 0.65 mg. of vitamin C per gram. Pokeweed, tall dock, and curly dock were found to contain nearly twice as much vitamin C as spinach; poverty-weed, shepherd's purse, and lamb's quarter possessed approximately the same vitamin C content as spinach; chickweed, the common dandelion, the red seeded dandelion, and prickly lettuce contained less vitamin C than the reference material.

The vitamin C content of wild greens appeared to be influenced by several factors such as soil, moisture, temperature, stage of development, and the time of day the sample was taken for analysis. There was also some indication that the vitamin C content was greatest in plants which were exposed to full sunlight and which were growing in fertile uncultivated soil. A more exhaustive and detailed study of the vitamin C values of such greens grown under carefully controlled conditions is necessary however before any general correlation of these factors with vitamin content can be drawn.

—*Life and Health*, April, 1948.

A Lawn Suggestion from a Reader

I have kept my lawn in such condition that it has been admired by all who passed our place. I have built up wasted lawns and made them worthwhile. And How! Never rake the lawn after mowing it, but cut the grass every week or oftener in wet weather. This not only saves the labor of raking, but returns to the soil that which it needs. Thus is returned to the soil what the grass has taken from it as well as what it has taken from the atmosphere. On a lawn 50' x 100' you will add in this manner at least ten bushels of compost during the summer instead of removing this amount from it.

Guy C. Gregg, 100 Exeter Avenue, West Pittston, Pa.

Hints for the Home Fruit Grower

By ROGER W. SMITH

ONE of the most delicately flavored of the small fruits, the raspberry, deserves a place in your fruit garden. Only by growing your own raspberries to perfection will you ever know the delicious flavor and fragrant aroma of this fruit at its best. Picking and eating raspberries in the open garden is an experience long to be remembered.

Ripe berries deteriorate very swiftly after picking. Their fragrance is gone in a matter of minutes; their true flavor is almost entirely lost after holding for forty-eight hours, so ephemeral are the aromatic oils and enzymes which give to this delectable fruit its fine flavor.

Just how much dietary value these easily lost substances contain is a matter of conjecture. Science has some knowledge of food values as based upon concrete substances. Little is really known about what is lost when fresh fruit wilts.

Before you set out a row or two of raspberries in your garden you will likely ask your neighbor for advice. You might study the garden column of your local newspaper for information. In the end you may reach the conclusion that the more information you gather from such sources, the more complicated and confusing becomes the simple matter of growing a few raspberries.

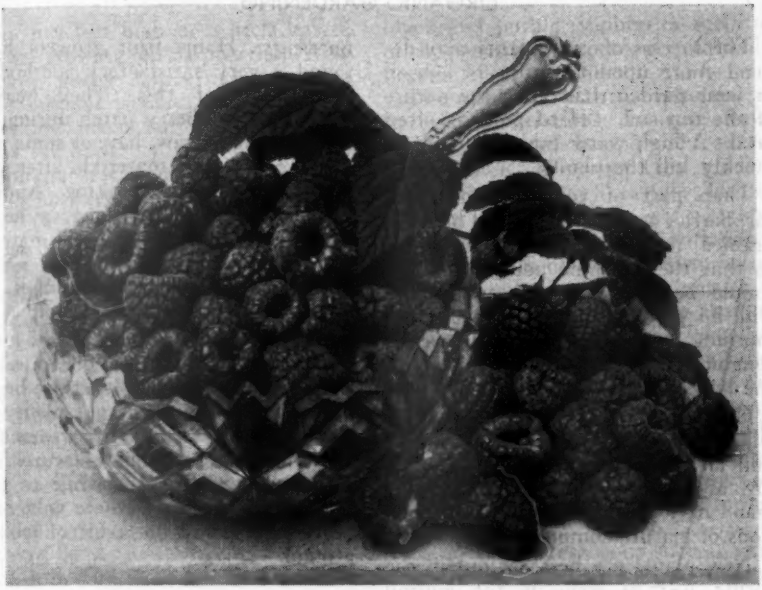
You have found that there are red raspberries and black-caps and purple raspberries, even yellow raspberries. The canes of one kind must be cut back to so-high in the spring, that with other kinds this practice would be fatal. You learned that in some kinds the tips of the canes, touching the ground, form new plants, that in others this is not so. And overshadowing all, is the terrible picture of the damage done by plant disease and insect pest.

Whether you intend to set out a few "improved" plants or have taken over an old planting, the solution to your difficulty is to get a clear picture of this plant as it really is. When you learn a little of the growth habits of the wild raspberries, from which the cultivated kinds are only slightly removed, you will see many ways to overcome difficulties.

Technically the raspberry belongs to the *Rubus* genus. Its fruit is distinguished from that of the blackberry (also a *Rubus*) by the ease with which the mass of drupelets separate from the receptacle. You know a raspberry from a blackberry. You might have trouble identifying a drupelet. A drupelet is the body mass of the fruit.

The fruit of the raspberry may be gathered quite easily without adhering stems; with blackberries this is usually difficult. Slight as this distinction may seem, you will find it important later when you make acquaintance with blackberry-raspberry hybrids.

Early colonists were familiar with the wild raspberries of Europe (the red-berried *R. idaeus*) and its cultivated varieties. In America they met two kinds of native raspberries, the red-berried *R. strigosus* and the black-berried *R. occidentalis*. Both of these were more vigorous than the wild raspberries they had known although they lacked delicacy of flavor. Most



A Bowl of Raspberries

garden varieties are today derived from these three and their hybrids.

The red-berried plants the colonists brought with them bore fruit of exceptional delicacy of flavor. Even today the popular conception of the raspberry is that of a red-berried fruit. Red raspberries are most favored in the fresh fruit market. Eventually American native raspberries displaced European types because of their greater hardiness.

The red raspberry has a finer flavor than the black-cap although the black-cap is much sweeter when ripe. Purple raspberries are the result of the crossing of red and black fruited types.

The sweet red raspberries of Europe and our own husky native red raspberries may be easily distinguished. Note the manner in which the fruit when ripe separates from the pedicule. The berry of the raspberry forms around a white core. In the European type this core has a decided swelling. Because of this irregularity, the fruit cannot be picked until it is quite ripe. The American red-raspberry lacks this swelling. For all that, the delicately flavored, aromatic, European raspberry has exceptional value as a home garden fruit. At its best it is unexcelled in delicacy of flavor.

Very popular types are: the popular Latham; Indian Summer, an everbearing variety, and Marcy, with the largest berries.

Other selections may be made from the following:

Reds: Milton, Cuthbert, Taylor, New Imperial, St. Regis Everbearing.

Blacks: Morrison, Cumberland; also Gregg, Kansas, Munger, Farmer, etc.

Purples: Sodus. Potomac, Columbian, etc.

Yellows: Golden Queen.

The location of your garden will do much to influence your selection; much of your success depends upon your ability to select that type of raspberry which will thrive in your locality.

Wild raspberries are native to cool climates. Their many variations in form and color of fruit were brought about by the efforts of the wild plants to fit into its surroundings.

The success of your plants may depend more upon the type of subsoil in your garden than upon the nature of the top soil. "Hard pan" is often fatal. A high water-table is likely to quickly kill the plants.

That part of your garden where raspberries are to grow should be well-drained, it should be clear and open so that the sunshine pours down. It should be a remote spot where you will be glad to loiter in the early morning and listen to the cheerful songbirds, and in late afternoon notice the humming of the bees.

Given ideal conditions, your plants will thrive provided their roots can find an easily available, regular supply of natural plant food. This demand may be readily met by applications of mature compost humus.

New plants are best set out in the spring just as soon as the gorund can be worked. With the ground well prepared and plenty of organic humus dug in you are off to a good start. In the "hedge system" red raspberries are commonly set 18" apart in the row and the rows six feet apart.

In the Northeastern States, black and purple raspberries are often set six feet apart in the rows and the rows placed eight feet apart. Black and purple raspberries lack the erect canes of the red kinds.

There are many ways to train raspberries. All of these depend very largely upon the natural habits of growth of this plant. Is it naturally erect or arching?

Essentially training and supporting the canes isn't done to help the plant grow. These systems make it easier to pick the fruit. The plant, in most cases, could get along very nicely without being tied up to posts or wires.

The production of a few quarts of delicately flavored berries is only possible if the plants are able to form many thousands of sunshine-collecting leaves. For fresh fruit to possess quality much vegetative growth is necessary. This plant growth needs plant nutrients. Home fruit growers have found a very satisfactory method of taking care of this. They heavily mulch the raspberry patch during the summer with straw, hay, or some partially composted materials after giving the soil a good soaking. Applied after a thorough watering, a heavy mulch of almost any neutral material —even mulch paper—aids the soil to retain moisture and encourages the formation of natural plant food.

Mulching with compost does much more than enable the soil to retain moisture during drought, it also brings natural plant nutrients in plenty to the plant roots. In a very practical sense it is best to follow Nature. You will find it well worth while to take a trip out to a place where wild raspberries grow and do a bit of looking around.

Take a trowel with you or a stout stick. When you come upon a clump of wild raspberries consider them. Notice first exposure to sunshine and probable drainage, then take your stick and dig around the roots. First you encounter an inch or two of loose leaf mold covered by several inches of fallen leaves, grass, and the like. Beneath this you will find a damp soil —quite often an earthworm.

Summing up—deep mulching with organic materials serves two purposes: it encourages plant growth by conserving moisture and it makes available much needed plant nutrients which otherwise would be unavailable because of the drying out of the soil. Eventually the mulch will be broken down to serve as a soil conditioner and, if its substances warrant it, also to serve as a source of plant food.

Cultivation of raspberries should cease with the formation of the fruit. Late cultivation encourages succulent growth very susceptible to winter injury.

The plants you set out did well. What about pruning? Naturally, in early spring, before growth starts all dead canes should be removed so that about five canes are left to each plant. These canes should be cut back to

about five feet high or a little less, if you are growing red raspberries. With black or purple raspberries, when the same method is used, the remaining canes are often cut back to six or seven fat buds.

You harvest your raspberries and find you have altogether too much fruit. Quick freezing is probably out of the question, so you turn to other methods. In the old days the raspberry was highly recommended by the country doctor. It was a standard diuretic.

You will find raspberry syrup not only good medicine but an excellent thirst quencher on a hot day. An old and very reliable recipe for raspberry syrup is found in all canning books and cook books. A couple of teaspoonsful of this syrup added to a glass of cold water makes a very refreshing drink.

With red raspberries, the suckers which spring up around your plants may be used to form new plants; with black and purple raspberries the tips of the canes form roots and eventually become the new plants.

The raspberry plant is beautiful in its infinite variations. Imagine growing in your own fruit garden a few plants of *R. ellipticus* (the golden. evergreen raspberry) a single plant of which is usually fourteen feet high and some twenty-six feet across, with canes three inches in diameter. Also, imagine what your problems might be if you grew *R. parvifolius,* the trailing raspberry of China, or the "woolly" raspberry, *R. lasiostylas* a very large fruited kind, the berries of which are covered with a thick mat of hairy growth. At present, you can probably not obtain any of these from your nurseryman. But he can supply you with delicious Lathams and Indian Summer.

More than likely your success with a row or two of raspberries will depend upon your own insight. You solve your own problems, in your own way.

Corn King Uses The Organic Method

According to the Des Moines *Sunday Register* for February 8, 1948, Don Radda was the "Corn King" for 1947 with 135 bushels per acre. The field in which Radda produced the 135.61 bushels per acre is Grundy silt loam, rolling enough that no plant was drowned out by last spring's rains but not rolling enough that any plant was washed out. The field was limed nine years ago and has since been in pasture with plenty of livestock on it at all times. Barnyard manure was spread over the entire field, but NO COMMERCIAL FERTILIZER WAS USED. The field was plowed in early spring to a depth of seven inches. After each rain, so long as the plants were small, the field was harrowed to conserve moisture and to control weeds.

ALL-AMERICA ROSE SELECTIONS 1949

Tallyho

IN AN annual competition which includes most of the outstanding new rose varieties of the world, the following roses have emerged as the 1949 high scoring winners:

Tallyho ..... Hybrid Tea
Forty-niner ..... Hybrid Tea

These are the roses chosen by the National Rose Jury to receive the coveted All-America awards for 1949. They have been judged and scored for two years in the 18 official A.A.R.S. trial gardens. Their testings and descriptions are based on actual trial behavior.

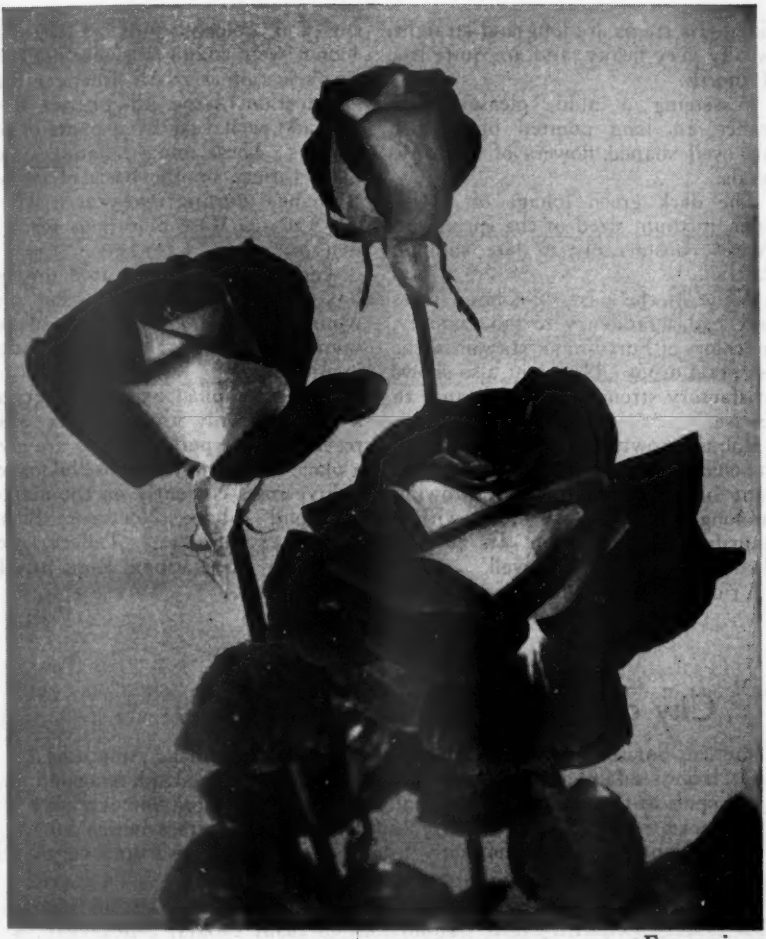
Both will be advertised and featured by the rose industry and associated dealers this fall and winter, 1948-49.

Forty-niner and Tallyho, two new hybrid tea roses, have won the National Rose Jury's coveted title, "All-America Rose Selection for 1949."

Both roses competed with the best new varieties of the nation's leading rose growers during two-year trials in 18 official test gardens.

Judged on the qualities of the ideal rose, Forty-niner and Tallyho achieved near perfect scores and demonstrated that they could flourish in any part of the country.

Forty-niner is probably the most brilliantly hued bi-colored rose ever



Forty-niner

introduced. Its outstanding feature is the color of its petals—a rich yellow outside which contrasts and yet harmonizes with a vivid red inside.

The yellow color is most evident in the bud which is a chrome yellow, sometimes overlaid with pink. This changes to straw yellow in the open bloom. The inside surface of the petals is an orient red which turns cherry red as the blossom ages.

Tallyho, also bi-colored, has an unusual tint that is entirely new to roses. Its coloring varies according to the weather and planting location.

While the outside of the petals fluctuates from crimson to cardinal red, its inside surface exhibits several shades of pink including Tyrian rose, China rose, phlox pink and neyron rose.

Roses competing for the National Rose Jury's annual award are judged on 12 counts. Most emphasis is placed on a plant's vitality, foliage, bud form and floriferousness (quantity and quality of blooms and inherent capacity to flower throughout the season).

Other qualities considered include fragrance, disease resistance, color, habit, substance, flower form and length and strength of stems.

Vigor is a strong trait of Forty-

niner. Its stems are long and straight, usually very heavy, and are quite free of thorns.

Possessing a mild, pleasant fragrance, its long pointed buds open into well shaped flowers of 30 to 40 petals.

The dark green foliage of Forty-niner, medium sized in the spring, increases considerably in late summer and fall.

While in the past, bi-colored roses have had a tendency to fade rapidly, the colors of Forty-niner stay until the last petal drops. The plant also shows satisfactory strength and resistance to disease.

Robust growth is one of the strongest characteristics of Tallyho. This plant branches continually, throwing out long straight flower stems with a beautiful bud at the top. Its flowers, when in full bloom, last well.

A rich spicy fragrance, unique coloring and graceful form in the open bloom were major reasons for Tallyho's selection as an All-American Rose.

Selection of the All-America Roses is made each year by a panel of rose experts. These impartial judges score each variety on the basis of its performance during two-year trials in All-America Rose Selections test gardens.

These gardens are located throughout the country insuring that prize winning plants are capable of surviving under any climatic conditions in America.

Scores compiled by the experts are averaged. Only those plants which receive nearly perfect scores are given a place on the national rose honor roll.

Five roses currently on the market, Diamond Jubilee, Nocturne, Pinkie, San Fernando and Taffeta, were chosen by the National Rose Jury for 1948 honors.

City of Glass—Garden Showplace

For the first time since the war, the City of Glass, America's largest retail garden center, at Farmingdale, Long Island, is again open to the public. A nationally famous garden center covering more than 16 acres, the City of Glass was for years a mecca for garden enthusiasts, not only from Long Island, but from every state in the union.

The immense greenhouses of this garden wonderland cover over 150,000 square feet, and contain over 500,000 individual panes of glass. In order to maintain a summer temperature of 85° the year round, the City of Glass consumes some 50 carloads of coal annually. The pipes through which heat and moisture are conveyed through the greenhouses are over 25 miles in length.

In addition to more than 3000 different varieties of trees, shrubs and flowers, the City of Glass carries a complete range of garden equipment, tools, accessories, furnishings and fixtures, ranging from 10c seed packets to $525 full-sized greenhouses. The City of Glass is a complete garden center in every sense of the word, its merchandise alone being valued at more than half a million dollars. Over one third of the one hundred skilled City of Glass employees have been trained at leading schools of Horticulture.

Ideally located at Farmingdale, the City of Glass is almost in the exact geographic center of Long Island, and a quick, pleasant drive from the metropolitan area. Motorists can always find ample accommodations at the City of Glass, for the attended parking lot has space for well over 2000 cars!

Garden Calendar — June

THE NORTH

The spring-blooming perennials reach their greatest triumph in the Rose, Queen of the Garden in June.

Flower Garden. If not already done, sow seeds of biennials and perennials. Some that you will not want to miss are sweet william, oenothera, canterbury bell, foxglove, and lupines. The lupines should be seeded where they are to grow to maturity as they develop a strong taproot and cannot be transplanted without injuring the plants.

Keep the rose bushes well mulched with compost superposed with a coarser plant material. Also carefully remove all leaves which appear diseased as well as all insects and remove them to the compost heap. In cutting roses leave enough foliage on the plants to keep them healthy and vigorous.

Dahlias can still be planted, but do not delay too long. Also seeds of heavenly blue morning glories may still be planted early in June. Make succession plantings of gladiolus, babysbreath, and poppies for prolonging the flowering of these plants through most of the summer and fall. Be sure to try some everlasting flowers as strawflowers and immortelles for autumn colors and winter bouquets. Creeping verbenas should be given some support to keep them off the ground and free from musting from rains. They deserve more use as cutflowers.

Irises should be cut back as soon as they have finished their growth and show signs of maturity. Narcissus bulbs should be taken out of the earth and stored in a cool, dry place for fall planting. Later in the month bulbs of snowdrop, scilla, grape hyacinth, crocus, fritillaria, and chinodoxa can be similarly taken up and stored for planting in the fall.

Open places in the garden should be planted with started annuals or perennials, as calendula, zinnia, calliopsis, linaria, and chinese asters.

Pyrethrums should be taken up, divided, and reset so that they make a

good growth before winter. Rock plants of all kinds may be increased by making cuttings at this time. Pinch out all but the main buds of dahlia, chrysanthemums, and delphiniums if you wish large specimen blooms. Remove the poorest stalks of hollyhocks to improve growth in the stronger stems.

Shrubs. Remove the fruit clusters from shrubs which have finished blooming as azaleas, rhododendrons, and others without ornamental value. Keep shrubs mulched. All shrubs should be pruned as soon as they have finished blooming.

THE WEST

Flower Garden. The blooming period of the perennial border can be greatly prolonged by keeping all faded flowers removed. This can also be accomplished by being generous with your neighbors and friends, because a border from which cut flowers are taken frequently lasts longer than one from which cuttings are not made. Cut delphiniums back to the ground level just as soon as the first blooming period has ended. New stems will develop and insure you with new stems for fall blooming. Canterbury bells and phlox will react same as the delphiniums.

Chrysanthemums and dahlias may still be planted in June. Irises should be taken up, divided, and reset this month. Heat-loving annuals as zinnias, salpiglossus, schizanthus, and cosmos can be planted in the garden this month. Also set out seedlings of ageratum, coreopsis, gallardia, marigold, petunia, portulaca, tithonia, and zinnia for the fall garden. Sow seeds of such perennials as columbine, carnation, alyssum, coralbell, nierembergia, verbena, and violet. For fragrance in the garden grow jasmine and natal plum.

Move the house plants into the garden and give them positions most suitable to their natures. Some will prefer dry sunny locations, others must have some shade.

Shrubs. Faded roses should be cut off with a sharp knife. Prune spring-flowering shrubs immediately after the blooming period is ended.

THE SOUTH

June is the month for heat-loviing annuals in the South. This is particularly true of plants belonging to the composite or daisy family.

Evergreen candytufts should be divided and replanted this month. Others which will benefit from replanting are creeping phloxes as divaricata, canadensis, and subulata all of which are excellent for ground cover and borders. Shade newly planted camellias. For fall color in the shrubbery, plant miniature sunflowers, tithonia, and tall ageratum. Separate and replant also Dutch irises, evergreen candytuft, and poinsettias.

Choice petunias can be propagated by layering. Do not overlook Salvia farinacea and dwarf phloxes, portulaca, and gladiolus.

Shrubs. Azalea, holly, boxwood, and other choice broad-leaved evergreens should be given liberal dressings of compost. Magnolias and mimosa are in full bloom and are a sight to behold. So also the blue-flowered chaste trees and the white, pink, and cerese flowered crepe myrtle trees which seem to symbolize the South. Wisterias require summer pruning to keep them within bounds. Do not neglect them. Fall blooms may be had by planting now such shrubs as duranta, lantana, hibiscus, the fall-blooming cassias, clerodendron, plumbago, daubentonia, and cestrums. Plant palms in June also.

Garbage-fed hogs often become infected with a "mean worm."

Garbage and a Mean Worm

By CAPT. W. A. BUSH

MAN is a gregarious animal. And this instinct is generally approved and thought to be an advantage. Some disadvantages, however, do arise when large numbers of people live in municipalities. One of these is that the production of waste food products is generally greater from each unit of population in cities than it is in rural districts. The easy disposal of such waste material that is enjoyed by the rural dweller with poultry, a pig or two, or a compost pit, is not practical or socially permissible for the urban dweller. So in cities some sanitary method of disposal has to be arranged in order that the dwellers may not be embarrassed by the accumulations of their waste food products. These consist, of course, of the material generally thought to be unfit for human consumption such as skin, fat, bones and outside leaves and stems of vegetables, as well as the material which is discarded after being prepared and served.

The problem of the disposal of such garbage has been variously solved. In the past some communities used methods which, rather than solving their problem, dumped it in other peoples' laps. There are still some people who can recall the amazing durability of the half-grapefruit rinds which they encountered while bathing in the ocean near and not so near New York City. In fact, the Atlantic Ocean near New York was receiving as much as 250,000

tons of garbage yearly at about the time when the other people into whose laps New York's problem—and garbage—had been dumped, were successful in returning the problem to the point of origin. In those dark ages, too, the Mississippi River was receiving 150,000 tons, the Missouri over 36,000 tons and the Ohio over 46,000 tons of garbage from the cities that had access to them. If and when it is recognized that throwing our rubbish over the fence into our neighbor's backyard is ruled out as a method of disposal, an interesting choice of alternatives still remains.

Burial, or dumping on land and covering with ashes, earth or even street sweepings, is one method. It sometimes can serve the additional purpose of land filling and can be followed by the establishment of parks or utilization for building purposes. Or the garbage can be burned. Both of these methods add an expense to that already entailed in collecting the garbage.

It is natural that the board of public works or other division of municipal government would prefer to dispose of its garbage without such an additional expense. Indeed, a method is much preferred if it can bring in some revenue and contribute part or possibly all of the expense of collection. Since the urban inhabitants of the United States of America are the most wasteful of all people for whom there are accessible records pertaining to garbage, ours is of great potential value. Realization of this value has been the quest of some individuals and many corporations. The quest has been along two main lines. Direct feeding to swine has been one of the most successful from a monetary standpoint and is in active operation in many parts of the United States. Conversion into salable products by physical or chemical processes is the only remaining alternative and has shown some promise in recent years but has been less productive of financial returns.

Swine are pre-eminent in their conversion operations, especially when compared with men or machines. No large investment in buildings, machinery and equipment is required, as is the case with the conversion of "reduction" plants. In fact, with swine we behold the chemical miracle of the finished product (pigs on the hoof) carrying out the conversion of its own raw material. And feeding experiments have established the fact that when compared with cattle or with poultry, swine are found to have the highest "gross efficiency." This expression is used by animal nutritionists to cover the utilization of the metabolizable energy consumed, above maintenance.

There are disadvantages in this method of disposal, however. Among the smaller ones might be mentioned the odors which are noticeable for quite a distance from the feeding grounds, the appearance of the feeding grounds themselves, and the cloud of flies and insects rising from them. But one disadvantage is far greater than these and has generally been overlooked. It is the great danger—the practical certainty, even — of the spreading of communicable parasitic disease.

This disease is trichinosis. Hogs that are kept on feeding grounds and receive municipal garbage may be infected from all the sources from which grain-fed hogs may occasionally be infected, namely infected rats, mice or other animals; but they will often be infected from eating undercooked or uncooked pork. Thus the danger of infection in garbage-fed hogs is many times greater than in grain-fed hogs. In fact, the actual occurrence of trichinosis among the garbage-eaters is five times that among the grain-eaters.

Trichina (Trichinella spiralis) is a mean worm. It is slender—a threadworm—and it is elusive. It finds its way into the intestine of the hog or of the human as a result of being eaten concealed in a minute cyst in pork. True, well-cooked pork will contain only dead encysted trichinae. But so durable are encysted trichinae that much smoked, cured, pickled or spiced pork that is cooked insufficiently or not at all, and all "rare" roasts may

contain live instead of dead cysts. Unfortunately these cysts are quite small and they match their surroundings rather well when the carcass is inspected. And we do not, in the United States, use the method known as "microscopic inspection," as some European countries do in order to avoid this very danger. So, thorough cooking is the only safeguard, and it is too frequently neglected.

When the cysts reach the intestine, the adult worms do not live there very long but the females have enough time to produce numerous young worms. The new generation makes its appearance six or seven days after the trichinous meat is eaten. The adults die and are eliminated after a busy two weeks of production of offspring and three or four weeks of less activity in the intestine. The young worms are deposited in the lymph spaces in the wall of the intestine. From thence, following the lymph channels, the young worms reach the large blood vessels and are shortly conveyed to the heart and thence to the blood vessels leading away from the heart. Thus they are soon conveyed by the blood to all parts of the body. Their preferred destination is the muscle, and on arrival at the destined muscle they drill their way into the muscle fibers. Their career is now assured. They grow without exertion on their part and at the expense of the muscular tissue. So for about three weeks they may be said to have the time of their lives. At the end of this time they wind themselves up into a neat spiral coil and cover themselves with a thin skin, forming the cysts previously mentioned. Their total size, including their snug-fitting homes, is only one-fiftieth of an inch. At this stage their active career is halted. They cannot move, or even eat. All they can do is await their emancipation and an opportunity to crown their existence by union with other worms and reproduction. Their liberation from the muscle of an animal that is used for food is effected so soon as the muscle tissue in which they are lodged is eaten by another animal that is a suitable host for this particular parasite. By being eaten it finds its way into the intestine . . . and "that is where we came in."

In this category of entertainment the host, in this instance a human being, receives nothing in the way of social spot cash. The guest does not even make himself agreeable. He selects the best locations without any decorous regard to social precedence and prefers the muscles that are active and have the richest blood supply, like the diaphragm, the larnyx, the throat and tongue. When the family first moves in, occupying their own cystic suitcases, the host may or may not immediately react unfavorably. There may be nausea, vomiting, or pains in the abdomen, or there may not. Generally there will be a dull sense of weakness, some muscular twitching and sense of ill-ease. Towards the end of the first weeks a watery swelling of the face and eyelids is noticed. This generally clears up, only to return in a few more weeks. When the invaders reach the muscle fibers and enjoy their period of maximum growth the host experiences severe muscular pains and his muscles are tough, swollen and tense. The eyeballs are inflamed, even bleeding a little. Swallowing is difficult and painful. Breathing is impaired and may become asthmatic. Fever and sweating are common and may continue for five or six weeks. It is during this intermediate stage of the invasion that death of the host usually occurs. If the host is to survive—and usually he does—into the period in which the trichinae curl and seal themselves up, the pains just described continue, and in addition the arms and legs, the abdomen and the face all become swollen. The host becomes anemic and skin eruptions are common. At this stage the host often contracts pneumonia.

His friends in the medical profession cannot greatly help the victim of this parasite. As might be expected from the account just given, the trouble has progressed too far by the time a doctor is consulted. There is at present no treatment which will reach and attack

the baby worms once they have entered the bloodstream.

There is nothing new in the information presented. What is remarkable is that the facts have not been more generally discussed. Parasites are an unpleasant topic of conversation, but any discussion of this particular parasite would surely lead to the decision to control it. For the exposure and the infection are very widespread. In an investigation undertaken by the United States Public Health Service and published less than two years ago, statistics were obtained from a total of 5,313 human diaphragms which were examined. These were from 37 states and the District of Columbia. One out of every six (6.225, to be exact) was infected!

Pork and all the specialized prepared products of the hog are among the most appetizing and nourishing of foods. It is quick, easy and economical to raise pigs and bring them up to top commercial weight. And, as has been shown, the hog is an efficient converter of food substances. To legislate against pigs would be like throwing out the baby with the bathwater. And fortunately the same Public Health Service points to a better way. Experiments published in 1943 show conclusively that sufficient cooking of garbage by steam kills the encysted larvae of trichinae, and that such treatment would be an effective control of swine and human trichinosis.

New York State Senator Thomas C. Desmond and a few others in public life have warned of the dangers in the present unregulated system. The knowledge of the dangers inherent in their current practices has not in itself been a sufficient motive to change the practices of the large hog feeders. There is no doubt that the several new steps in the feeding technique that would be required for efficient sterilization would impair the present streamlined dumping of infected food and add somewhat to the expense of the feed yard. The garbage would have to be transferred to cookers and there be adequately steamed. It would then be much more fluid, soupy and difficult to handle. But it would still have to be handled again to be transferred to the feeding troughs. Some feeders claim that their hogs will not eat cooked garbage. But against this is the testimony of others to the effect that cooked garbage is more palatable to hogs and better utilized by them. *De gustibus porcorum non est disputandum.*

By, as it were, carrying the cooking process still further, in fact to dryness, the recoverable values of the garbage are remarkably altered both in kind and in quantity. In fact such a process offers an alternative which yields a revenue capable of reducing notably the cost of garbage collection. As previously admitted, the hog still is preeminent in the economy of his conversion processes but it is clear that we pay too high a price in health for the low-costing feed at the garbage-feeding grounds.

Municipal garbage is of curiously uniform composition in the various parts of the country where observations have been made. Garbage is mostly water. The variation from location to location is between 70 and 82 per cent water. The dried residue is singularly uniform in composition too, containing from 10 to 20 per cent of fat, 14 to 23 per cent of protein-like substances, 38 to 50 per cent of carbohydrate, including fibrous types, and 11 to 17 per cent of ash which is largely calcium phosphate. It is easy to visualize good values obtainable by the commercial separation of some of these components. In fact, good values and excellent profits have been promised to investors by promoters who, from the earliest production of municipal wastes, have been attracted by the idea of obtaining something for nothing. Few privately owned garbage-reduction plants have made money. But some municipally owned and operated plants do contribute well to the cost of garbage collection. Most of the plants, of both types of ownership, extract the grease from the wet garbage in large stirring cookers by the

use of a petroleum solvent similar to gasoline. The extracted garbage is then dried. The grease and gasoline are separated by distillation and the gasoline is re-used. As would be expected, the fate of some of these plants has been to be destroyed by explosion and fire. A large plant in Chicago a generation ago terminated its operations in this way.

An alternative method, which is a relatively recent development, is to dry the garbage without previous degreasing and then put the dried material through a conventional oil-milling process. There were a number of difficulties to overcome. The material is so heterogeneous in size, shape, consistency and texture, that it is difficult to prepare it for the process. For this requires uniformity of feed and adaptability to conveying mechanism. Ferrous and—more difficultly—non-ferrous metals must be removed, temperatures, invisible moisture content, and other operating conditions must be regulated within close limits. The difficulties have been overcome and so this alternative stands as one that does return a contribution to the cost of collecting municipal garbage, that completely eliminates the danger of the spread of trichinosis from garbage-feeding, that contributes to relieve the nation's current shortage of fats, and that does not involve danger of explosion or fire.

With all the alternatives to raw-garbage-feeding that exist, as described here and as may occur to other investigators, there surely is little justification for continuance, anywhere, of the one method of disposal that is demonstrably contributing to the spread of disease.

Try This With Your Sunflower Seeds

One of our readers grew a bushel of sunflower seeds organically. He processed them for food as follows: Grind the cleaned sunflower seeds in a family grist mill with the plates set just close enough so that none of the seeds go through without having the hull removed. Many of the kernels will be broken, but for home consumption this is no disadvantage. Next, put the ground sunflower seeds in a basin or tub of water and stir them. The kernels will sink to the bottom and the hulls will remain on top and may easily be poured off with the water or skimmed off. The hulled seeds are then spread thinly in shallow pans and dried, preferably in the sun. The final step is to grind the kernels into coarse meal or cut them up into small pieces with a liquidizer. Sprinkle the resulting sunflower seed meal on your breakfast cereal or stewed fruit, and you will say, "M-m-m-m-m-m-m, Good!"

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During the recent great war, Switzerland was short in seeds and one expert expressed the opinion that certain Alpine valleys are as well adapted for the production of seeds as they are for the breeding of cows and goats. This opinion was put to a test. In February of 1942, we discussed the matter in the communal assemblies of five mountain villages of the Grisons and induced these hardy men to make 35 acres of their grazing land available for this purpose. With the support of the authorities in Berne and Zurich, we started immediately. During the five years since then, this Bergpflanzen Oberhalbstein has produced large quantities of high-grade seed potatoes and vegetable seeds. Compost and sheep muck were used instead of the artificial chemical fertilizers. The fields in which these seeds and potatoes were produced are from 3500 to 5500 feet above sea level. There were no plant diseases of any kind in evidence, and the products were of commendable quality. Even wheat was grown at an elevation of 4500 feet. Incidentally, we taught the Alpine people to grow and eat more vegetables. It appears evident that with some legislative backing, seed-production could become a substantial pillar of the mountaineers' livelihood, at least in certain parts of the Alps (Wallis, Grisons, and Tessin).

By *Ralph Bircher, Editor of Wendepunkt.*

You Will Want to read . . .

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Lady Howard is the widow of Sir Albert Howard, the founder of the Organic Farming movement. She has made herself an authority on agricultural problems and tells in this book of her theory that degenerative diseases are on the increase all over the world due to our shot-in-the-arm chemical fertilizing methods of growing the food we eat. Naturally, she advocates the adoption of Sir Albert Howard's theories and stresses the fact that Man's health and happiness depend upon the use he makes of THE EARTH'S GREEN CARPET. The book is vividly written, and the scramble for life of all growing things is graphically set forth. Nature holds everything in place if Man permits her to, but when his depradations are successful the precious top-soil is lost and blows across the land or washes downstream. Lady Howard warns us that it is almost too late, and that if we do not change our methods Man can easily vanish from the face of the earth. A Rodale Press book. Cloth. 260 pp. $3.00.

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DAHLIAS—WHAT IS KNOWN ABOUT THEM by Morgan T. Riley (Orange Judd Publishing Company, Inc., New York, New York, 1947. $2.50).

The wide popularity of the dahlia amply justifies the careful and excellent treatment it has been given in this book. It freely informs and advises the amateur concerning the varieties, the cultural methods that will insure success in the growing of the plants, methods of asexual and sexual reproduction, as well as other details that will make your dahlia growing satisfying and successful.

BEGONIAS FOR AMERICAN HOMES AND GARDENS by Helen K. Krauss (The Macmillan Company, New York, New York, 1947. $4.00).

Here, at long last, is an authoritative book on the history, culture, and varieties of begonias. Probably no other plant is so popular for the house and conservatory as the begonia, or so interesting and delightful in the window and summer garden. There are surprisingly few books that deal adequately with the begonias, so that a real need has been met in making this authorative treatment available to gardeners. Of especial interest are the chapters which deal so completely with the history of the begonia, the detailed descriptions of the varieties, and the carefully written cultural methods.

INTO THE FREEZER AND OUT by Donald K. Tressler, Clifford F. Evers, and Lucy Long (The Avi Publishing Company, Inc., New York, New York, 1946. $2.50).

The preservation of foods by deep freezing has developed within the last few years and now is being made available to the masses of our people in locker plants, and in home units. The directions for preparing foods and other information so badly needed have not been available. This book certainly is timely and will fill a real need. It explains in clear and simple language the preparation of all kinds of foods and drinks for the freezer, how to budget your locker space, how to handle frozen foods when removed from the locker, the hidden merits of frozen foods, and other valuable information on foods and freezers.

WEEDS OF LAWN AND GARDEN by John M. Fogg, Jr. (University of Pennsylvania Press, 3446 Walnut Street, Philadelphia 4, Pa.) 1946. $2.50.

Weeds have at times been defined as "plants growing out of place." In the successful growing of lawn mixtures, vegetables, herbs, and flowers it usually is of the greatest importance to eliminate weeds which grow in competition. How to recognize weeds in the early plant stage is sometimes difficult and annoying. The author presents a clear, well-planned guide which is supplemented by exceptionally good drawings. The book is especially designed for the home gardener and may serve as a handbook of weeds for the eastern temperate North America.

ROBERT'S COMMERCIAL POULTRY RAISING by H. Armstrong Roberts and Clarence S. Platt. (David McKay Company, Washington Square, Philadelphia, Pa.) 1947. $3.50.

I am delighted to review, for our readers, this comprehensive, clearly written, well illustrated treatise on all aspects of successful poultry growing and selling. It combines the wide practical experience of the senior author and the theoretical training and results of the twenty years of research of the junior author. It is the good balance between the practice and theory that makes this book so valuable to the poultry industry. Especial emphasis is placed on economy and efficiency which are regarded as the cornerstones of success in any undertaking. The authors wisely warn the prospective poultry grower against the too-often held idea that the chicken business is a get-rich-quick scheme. The book is well tailored and the paper is of good quality. The 329 illustrations are well chosen and are highly instructive. Special chapters are devoted to ducks, geese, turkeys, guineas, and pigeons.

PERENNIAL HARVEST by Philip Hillyer Smith. (Harper & Brothers, 49 East 33rd Street, New York 16, New York) 1948 $3.00.

"Perennial Harvest" is one man's experience on an isolated farm which fought back and finally expelled those who so badly treated it. The author describes the general state of collapse of the buildings and the extent to which the woodland had already reached out and reclaimed the once cultivated fields. Gradually and sensibly the buildings were restored and the fields returned to cultivation. One gets the feeling that all is well with plants, animals, and man if the laws of nature are followed. He who fights nature, using an over-specialized training in some particular field of knowledge as a weapon, is doomed before he begins. Nature gives you a peace that surpasses all understanding.

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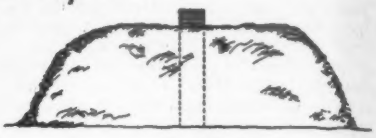

Compost should, in no case, be confused with manure or partly decomposed organic matter of any kind. Compost is a product of certain chemical and physical changes which are brought about mostly by the organisms in the soil. It must be made with a certain degree of exactness and precision. It is made by composting together green matter, fresh manure including the excreta and urine of animals, soil, water, air, and soil organisms.

By green matter is meant any kind of plant material that can be decomposed in the compost heap as leaves, stems, roots, lawn clippings, garbage, the finer branches and twigs of shrubs and trees, hedge trimmings, banana residues, beet wastes, cannery wastes, brewery wastes, apple pomace, weeds of all kinds, cotton wastes, seaweeds, sawdust and chipped wood in limited amounts, pea vines, spent hops, straw, poison-free wastes from food fairs and grocery stores, and almost any other kind of plant material that may happen to occur in your vicinity.

Before being composted, green material should be allowed to wilt until it has the approximate water content of hay that is considered fit to be put in the haymow or haystack. On a bright sunny and airy day, hay that is cut in the morning will be sufficiently dry to be stacked in the afternoon of the same day. The wilted plant materials, refererd to as the "green materials" are incorporated in the

compost heap in layers six inches thick. They must be layered in such a way that they will not form compact layers that are incapable of being aerated. Materials, such as lawn clippings and the leaves of trees, which are apt to form compact layers must be mixed with other coarser plant materials as tomato vines, bean stems, and hedge trimmings. Indeed, it may be desirable to place on the ground a heap of twigs extending through the middle of the longest dimension of the heap like a backbone to facilitate the aeration of the heap.

Other conditions being the same, the finer the particles of the green materials, the faster they will decompose in the compost heap. For this reason it is desirable to put the plant materials through a shredder or grinder of some kind which is run at sufficiently high speed to reduce to fine pieces such materials as stems of shrubs, sunflower, corn, and such other plant residues as corn cobs and garbage. In a recent issue of the Organic Gardening Magazine was a description and illustrations of a home-made plant material shredder as designed by Dr. Laskey and built by him at a cost of about $15.00. A shredder not only breaks the coarser plant materials into small pieces, but mixes the various plant materials thoroughly so that they can be layered more uniformly without the danger of packing into hard-to-aerate layers. Such mixed layering of the plant materials will also lead to a more rapid decomposition as the moist, naturally succulent materials will be in close contact with other drier materials.

As a rule it is a good plan to collect the plant materials from different sources and allow them to accumulate near the place where the heap is to be built. When all the green materials and other necessary constituents for the building of the heap are assembled, the heap should be constructed with precision to its full height, section by section if necessary.

(*Please turn to page* 68)

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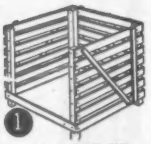

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Compost Correspondence . .

COMPOSTING MORNING GLORY

Q. Is it possible to use morning glory vines for making compost?

W. F., Flint, Michigan.

A. In a recent issue of *Organic Gardening,* I read about someone who had great trouble composting wild morning glory vines because they persisted in growing in the heap. I have three 4' by 6' compost boxes in which I have composted quantities of morning glories with no such difficulty. I believe this is the answer to his trouble.

V. H. H., Vista, Calif.

—o—

WHEN APPLY COMPOST?

Q. I am a subscriber to *Organic Gardening* and would like to know when the compost should be added to the soil, before or after planting?

H. A. B., Portland, Oregon.

A. If possible, compost should be added before planting so that it can be worked into the surface layer of the soil without injuring the plant rootlets. It is a good practice also to mulch the soil lightly with compost after the seedlings are an inch or two high. This mulch will help hold the soil against erosion and will discourage the growth of weeds.

—o—

MATERIALS FOR COMPOSTING

Q. I have been interested for some time in building humus in the soil, but I am at a loss to find material for making a compost heap. Can you help me?

L. S. B., Cape Girardeau, Mo.

A. Material for making a compost heap is not hard to find as you may think. Recently one of our readers told us that he was hunting materials

Farmers Of 40 Centuries, *by* F. H. KING, D.Sc.

formerly Professor of Agricultural Physics, University of Wisconsin; and Chief of Division of Soil Management, U. S. Dept. of Agriculture.

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for composting and began to think it was hopeless until he parked his car near a Giant Food Store, and noticed that each day a truck load of plant waste was being discarded. He found, upon inquiry, that it was possible for him to get this waste material without cost to himself. This material plus manure, which he was able to get from a local riding stable, enabled him to build all the compost he could use for his garden.

—o—

ADCO COMPOST

Q. Do you recommend the use of compost made with ADCO, a commercial activator?

A. P. B., Port Blakely, Wash.

A. We do not recommend the use of any activator which includes artificial chemical fertilizers. If ADCO is free from these and is a purely biological activator, we would not hesitate to use it. Purchasing a biological activator for the compost heap is similar to purchasing a yeast cake to make light bread. Or you can do as your grandmother did, save your own starter. Compost from a previously made heap is excellent for innoculating a new heap. For best results, sprinkle a little compost in each layer of the heap.

—o—

AMOUNT OF COMPOST TO USE

Q. How much compost should be used in the garden or farm?

L. R. S., Detroit, Michigan.

A. A layer over the surface of the soil of from one to two inches in thickness is regarded as an effective application of compost. This means that a cubic foot of compost would be sufficient for from six to ten square feet of garden space. I have expressed the amount of compost by volume rather than by weight because the weight varies greatly according to its water-content. Compost is so perfectly balanced that it never "burns" the plants even if it is used in almost pure form.

MULCHED STRAWBERRIES

Q. In planting strawberries the crown must not be covered, so I would like to know if in removing the winter mulch it is necessary to uncover all the way to the earth?

E. C. K., Severn, Md.

A. It is well to leave a residual mulch in your strawberry patch. This will prevent the growth of weeds and make cultivation unnecessary. Strawberry plants have fibrous roots which are easily injured by cultivation.

—o—

PHOSPHATE FOR THE SOIL

Q. What is the best and safest method of applying phosphorus to the soil?

R. P. B., Aiken, S. C.

A. The only safe way to apply phosphorus to the soil is as raw ground

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phosphate rock or other natural product containing phosphorus. Superphosphate is too soluble and causes the soil to become acid.

—o—

POTASH FOR THE SOIL

Q. Recently commercial lye was recommended to me as a source of potash in making compost. Will lye take the place of wood ashes?

S. H. G., Fremont, Ohio.

A. Commercial lye is far too caustic to be used in the compost heap or in the soil. Wood ashes are far better as a source of potash.

—o—

RECLAIMING WORN-OUT SOIL

Q. What measures must be taken to reclaim worn-out land?

C. G., Minneapolis, Minn.

A. In reclaiming worn-out farm land the following steps should be taken: 1) First take every possible measure to prevent water from running off the land. 2) In preparing the soil for planting, follow the contours as far as possible. 3) Without plowing, work the soil down with a disk or otherwise to form a seed bed. 4) Add sufficient pulverized raw lime to neutralize soil acids (About 2 tons per acre). 5) Plant a soil-building cover crop including a number of legumes

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and grasses. 6) During the first two years, cut the cover crop and such native plants that grow a number of times each year and allow all plant materials to accumulate on the soil as a mulch. 7) Increase the humus content of the soil as much as possible.

—o—

BROWN ROT ON PEACHES

Q. Although I have mulched my peach trees and have a lovely crop of earthworms, the peaches have dropped because of brown rot. The other day I noticed that quite a bit of jelly (gum) had appeared on the limbs. Have you any suggestions?

M. R., Nashville, Tenn.

A. Brown rot is caused by a fungus which winters in the cankers and in

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the hard wrinkled fruits (mummies). In the spring the cankers and mummies produce millions of spores which attack the young twigs and eventually the branches and trunks to form the cankers. Also the young fruits are attacked and destroyed. This disease can be largely controlled by proper sanitation. Destroy all mummified fruits and scrape the cankers and give them a dressing of tree paste made of cow manure and clay as described in the April issue of the magazine. Continue the compost and mulch and practice proper sanitation and you will again have real peaches.

—o—

CONTROL OF THRIPS

Q. Formerly I soaked my gladiolus corms in lysol to control thrips. This year I had thought of dusting them with 5% DDT. Would this be a desirable measure to take?

A. A. G., Withee, Wis.

A. We do not advocate the treatment of corms or bulbs with poisons of any kind, because these poisons are injurious to the soil organisms. If the corms are properly cleaned and carefully stored they can be relatively free from thrips. Plant them with plenty of properly made compost, and you will not be bothered with thrips. A number of our readers have succeeded with compost after years of failure with chemical fertilizers and poison sprays and dusts.

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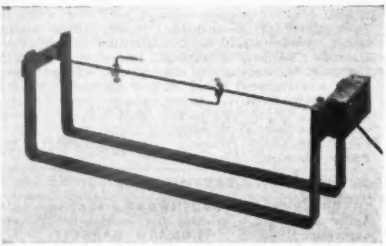
COAL ASH INJURY TO GARDEN

Q. Do you recommend the use of coal ashes as a fertilizer for the garden?

G. R., Trenton, N. J.

A. Most coals contain sulphur and in burning about three-quarters of this sulphur is retained in the ash as calcium sulphide. This substance in contact with water produces hydrogen sulphide which is definitely poisonous to plant and animal life. It is this substance which probably makes coal ash harmful and unsuitable for the soil.

New Item . . . .



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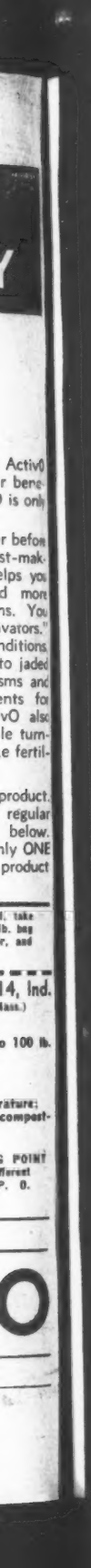
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